ELECTRICAL REVIEW

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A DEVELOPMENT*

THE 1¼ GALLON NEW LOOK water heater will henceforth be manufactured with a moulded bakelite outer container.

We regard this as a progressive development in the construction of storage water heaters, as well as an important factor in the saving of scarce metals urgently required for re-armament.

The interior specification and efficiency are in no way impaired or affected, and the heater will continue to be supplied in four finishes — Pastel Green, Cream, White and Pastel Blue.

Berry's New Look water heater

*moulded in bakelite

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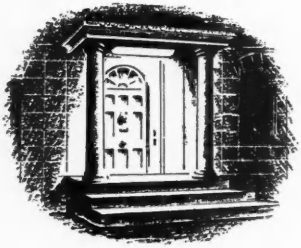

AUTOMATIC TIME CONTROL

T.21

For Domestic Loads

The Sangamo Switch is a boon in any home or building, saving time and trouble, conserving fuel and power, and adding to comfort and convenience. Its many uses include automatic switching of corridor, porch, or lodge gate lighting, control of electric cookers, wireless sets, immersion heaters, etc., at any predetermined time and whether the occupier is "in" or "out." The Sangamo Time Switch is inexpensive, easily fitted and designed for a life-time of accurate service.

The Sangamo Type SS Time Switch can be supplied to carry out the following sequence of operations. "On" at sunset and "off" at sunrise (or 45 minutes either side). Or, alternatively, "on" at sunset (± 45 minutes). "Off" at any time between 8.30 p.m. and 1 a.m. "On" between 3.15 a.m. and 8.45 a.m. "Off" at sunrise (± 45 minutes).

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ELECTRICAL REVIEW

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THE OLDEST ELECTRICAL PAPER • ESTABLISHED 1872

Power and Production

DIRE EFFECTS OF PLANT SHORTAGE

EVER since the war ended the electricity supply industry has been overtaken by events. Those responsible have worked harder and faster only to find the situation worse if anything. First there was reconstruction, coupled with the need to recover our export trade; this placed a heavy burden on ageing plant which, in their unwisdom, Governments thought would be capable of seeing the country through the "post-war period." It seems to have been thought that once this period was passed there would be more than sufficient generating and distribution plant.

Warnings Unheeded

Warnings by the former Central Electricity Board were not heeded, or if they were it was decided that money, labour and materials must be directed towards supposedly more urgent tasks. It was not realized then, and even now realization is incomplete, that in modern life electricity is not just a desirable ancillary but the basis of almost every activity.

The need for great production for home and export purposes had not diminished when it became an urgent necessity to re-arm. As a consequence the demand for power is more clamant and the evil effects of past policy are becoming more apparent.

Rearmament has not only increased the load but has reduced the chances of meeting it by increasing the scarcity of the materials needed for buildings and plant. The construction of several stations, for instance, has been delayed recently by lack of steel.

Revised Programme

Already before rearmament was embarked upon the B.E.A. realized that circumstances would not permit its full requirements to be met. Accordingly it agreed with manufacturers a "realistic" programme with an upper limit of 1,250,000 kW in 1951 rising to 1,800,000 kW by 1956. Now the possibility of achieving these aims depends upon the Government's attitude. Yet it is still uncertain whether the Government appreciates the position. In his annual report on electricity, issued at the same time as the B.E.A. report (which is reviewed in this issue), the Minister of Fuel and Power says:—

> "Despite a decline in the total amount of civil investment because of rearmament, it was decided that investment for electrical generating plant should be commensurate with a programme of commissioning of new plant which should reach 1,550,000 kW in 1955; some restriction of new distribution works was unavoidable."

This indicates, while ostensibly making a concession, that expenditure

upon the provision of electricity is "civil investment" (i.e., not of vital importance) when, in fact, it is predominantly "re-armament."

The B.E.A. is justified in its "serious concern" at the limitation upon new plant proposed by the Government. It rightly says that this would not only prolong the present conditions of plant shortage and severe load shedding but it would also hinder that greater mechanization and extended use of power in industry which can make the most effective contribution to improved industrial efficiency. We look to whatever Government that may result from next week's General Election to make this question one of the first subjects for consideration.

TECHNOLOGICAL EDUCATION

The presidential address by Sir John Hacking at the Institution of Electrical Engineers last week, which is summarized elsewhere in this issue, was prefaced with an expression of regret that the decisions now being made for implementing the proposals contained in the November, 1950. report of the National Advisory Council on Education for Industry and Commerce seemed likely to go forward without the hoped-for consultations with the three senior engineering institutions. Since the major part of the higher technology of this country may be said to reside within the memberships of these three professional groups, their full collaboration would seem to be essential to any scheme of this kind, the success of which is a national necessity. It is to be hoped the Ministry of Education will not too long deny them an opportunity of developing their suggestions.

ELECTRICAL RESEARCH

Since what was then called the auxiliary laboratory at Perivale of the British Electrical and Allied Industries Research Association was officially opened sixteen years ago there have not been any "open days" there until last week. The Association's income was then £66,000; last year it was £216,000 and during the intervening period nearly £2 million has been spent on research and ancillary services. Last week's event had a dual purpose; it was first a display of achievement at the laboratory and other establishments and of extra-mural investigations undertaken on behalf of E.R.A. members. The latter again had their attention drawn to the necessity for going ahead with the building at Leatherhead. The work done at Perivale is an assurance that improved accommodation will enable E.R.A. to serve even better the interests of the community.

PRICE MAINTENANCE

Rather belatedly, the Electrical Fair Trading Council has presented a case for the exclusion of the electrical industry from any legislation of the type adumbrated last June in the White Paper on Resale Price Maintenance. It follows generally the lines adopted in the statement issued by the British Refrigeration Association last month. The principal argument is that adequate "margins" must be assured to distributors if they are to maintain their essential advisory and maintenance services. In commenting on the White Paper in our issue of 29th June last we said and we repeat:

> "The margins allowed for in the prices of electrical apparatus and equipment are by no means excessive. In fact the general complaint is that these margins are hardly enough to cover the after-sale service which customers expect from reputable electrical dealers. Those who cut prices therefore are either not prepared to give that service or are risking financial trouble."

DOMESTIC APPLIANCE SALES

Although it cannot be said that conditions are altogether favourable to the sale of domestic electrical appliances, the *Board of Trade* statistics of retail trade in August show that they did not share in the decline experienced in other directions. Actually as compared with August last year the sales of "independent" radio and electrical shops were 11 per cent higher and for the first eight months of the year 18 per cent more than in the corresponding period of last year. The effect of the prohibition of the use of certain materials for domestic appliances is not yet being fully felt but it is to be hoped that the use of substitute materials, where possible, will soften the serious blow dealt to the domestic appliance manufacturers by this regrettable, but necessary, measure.

Granite Quarrying

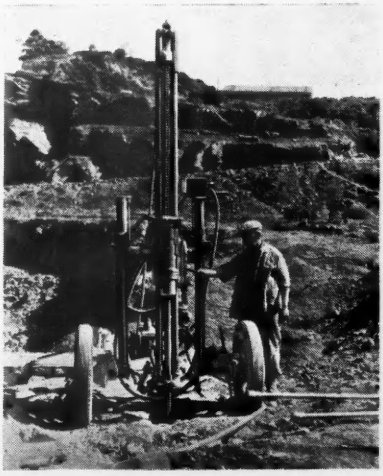
Groby granite quarry represents an outstanding example of modern production plant adapted to the original buildings

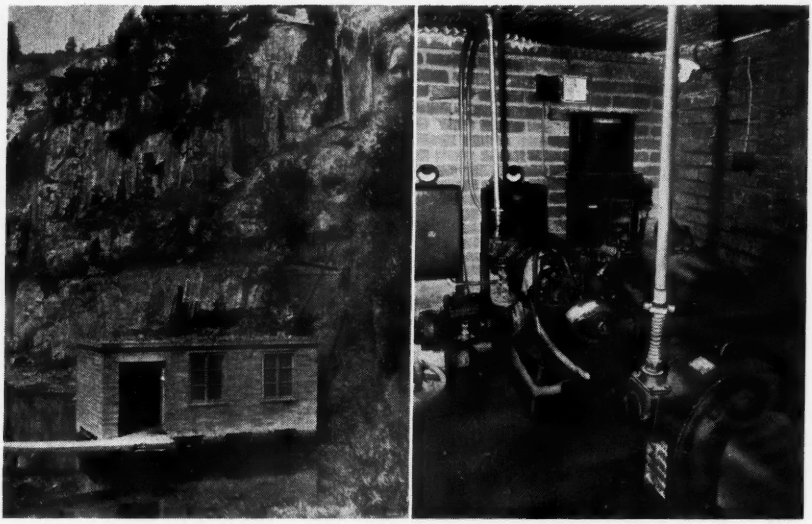
THE granite quarry and the associated workings at Groby, Leicestershire, of the Groby Granite Co., Ltd., a subsidiary company of the Amalgamated Roadstone Corporation, Ltd., are an outstanding example of a most modern installation adapted to the original buildings and structure which date back nearly 50 years.

The actual quarry is below ground level, at present to a maximum depth of about 80ft in two stages. The faces at both levels are being worked. The rock is won, first, by compressed-air drilling in battery formation; for simultaneous blasting up to a total of about 80 holes are drilled into the rock, the vertical holes to a depth of about 18ft at about 5 or 6ft centres. In similar formation horizontal holes are drilled so that they communicate with the vertical ones.

The drilling is effected by 2¼in diameter tungsten bits screwed on to extension rods which are generally 6ft long, the complete tool being held in and operated by a continuous chain-containing drifter on a portable wagon drill. The rods are held in the drifter by means of shanks. The plunge and rotation motions of the tool are operated by compressed air in the drifter. The holes are charged with dynamite cartridges and the firing leads are run from each hole and connected up to a main run of " Cordtex " which is led back to an electric battery firing unit. At each face blasting operation something like 3,000 tons of rock is released, in all sizes, the maximum being about 3 or 4ft square. The larger pieces of rock are subjected to secondary blasting to reduce them to suitable sizes for handling by a 36in by 42in Robey Farrell primary crusher. For

In preparation for major blasting holes are drilled in the quarry face by compressed-air wagon drills





Water collected in the quarry from the surface is removed by two 30 h.p. motor driven pumps in a pumping station near the lowest quarry level

the secondary blasting holes are drilled in the large lumps of rock by compressed air jack hammers. The drilling for blasting constitutes, by far, the greatest use of compressed air throughout the workings and to provide it four 90 h.p. motor driven compressors are installed in the works buildings at ground level almost at the edge of the quarry. All the compressor motors are Electric Construction Co. slip-ring 1,410 r.p.m. directly coupled machines and they have the usual stator switch and rotor resistance control. The air is supplied at 90 lb/sq in.

The only direct use of electricity in the quarry proper is for pumping away water, which is collected mainly from the surface. For this purpose there is a pumping station near the lowest level of the quarry, which is equipped with two English Electric 30 h.p. directly motor driven centrifugal pumps. The motors are of 1,450 r.p.m., squirrel-cage, with star-delta contactor starters.

All the broken rock released from the faces is loaded by diesel excavators into dumpers which carry the material up an incline to the works on the surface. Here the loads are first tipped into the primary crusher, the material being fed into it by heavy chain feeders which are raised and lowered to control the flow by compressed air. This crusher is driven by a Crompton Parkinson 150 h.p., 980 r.p.m. slip-ring motor which transmits power by multi-V-belt with a speed reduction ratio of about 6 to 1 directly on to a shaft that carries eccentrics which actuate the hinged crushing jaw. The motor is controlled by Erskine Heap equipment incorporating a stator oil switch and a water rotor resistance regulator.

From the main crusher the rock falls on to a short 7½ h.p. motor driven conveyor which delivers on to a longer 13 h.p. conveyor which carries rock to a secondary Kennedy gyratory crusher. This equipment is driven by an E.E. 85 h.p., 750 r.p.m. slip-ring motor which transmits direct from the horizontal to the vertical by a long and wide belt with a speed ratio of about 3 to 1. The rotor metallic resistance and stator oil switch method of control is adopted here, and in later references to slip-ring motors in this article, where there is no particular mention of the control, a similar scheme may be taken for granted.

From the secondary crusher the rock is lifted by a bucket elevator on to a vibrating scalping screen. The elevator is driven by

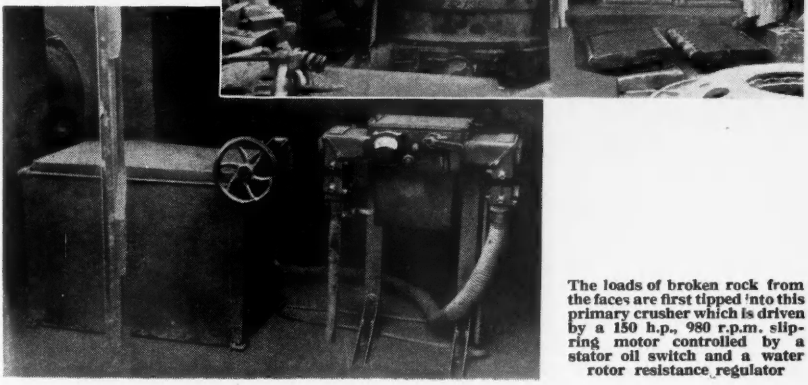
an E.E. 10 h.p., 715 r.p.m. squirrel-cage motor which transmits through a right angle closed gearing to give a speed at the elevator end drum of 12 r.p.m. Star-delta starting is employed in this case. On the agitating scalping screen frame is mounted an E.E. 5 h.p., 1,440 r.p.m. slip-ring motor from which there is about even ratio belt transmission to the eccentric shaft.

The main products of the scalping screen pass on to either a Pegson Gyrasphere crusher or a Kennedy gyratory crusher. The drive of the former is similar in all respects to that for the main crusher, except that in this case the rotor resistance is metallic and the transmission reduction ratio is about 2 to 1. The Kennedy crusher, however, is driven by an E.E. 100 h.p., 1,460 r.p.m. slip-ring motor transmitting power by V-belt to a countershaft and then by flat belt to the crusher shaft, the overall speed reduction being about 2 to 1.

The rock which passes through the upper deck of the scalping screen can be belt conveyor fed at will to a rotary screen which provides normally 1in, 1½in and 2in grades of rock ready for despatch. These screen sizes and the sizes given for several other screens to be mentioned later can be varied according to the production programme, which is based on demand.

The rotary screen has an E.E. 15 h.p., 750 r.p.m. squirrel-cage motor drive with two-stage transmission, 5 to 1 ratio in each case, first by belt to a countershaft and then by bevel gear on to the screen shaft. The material delivered from the Pegson Gyrasphere and second Kennedy gyratory crusher, that is the rejects from the scalping screen, is conveyor fed to a double-deck vibrating screen which passes grades of ¼in to dust. Both screening decks are rigidly held in a single frame which is agitated by an off-balance flywheel to which power is transmitted by an even ratio belt from a 10 h.p. Alpha Harris 1,420 r.p.m. slip-ring motor.

The rejects from each deck pass on to a short flow line of two screens, i.e., all told four screens are served immediately from the double-deck screen, each pair of single-deck screens being arranged in sequence flow. The grade sizes delivered by one pair of screens are $\frac{5}{16}$in, $\frac{3}{8}$in and in, while the grade sizes of the other pair of screens are ¾in, 1in and 1¼in. Each of these four screens is driven by a 5 h.p. motor.



The loads of broken rock from the faces are first tipped into this primary crusher which is driven by a 150 h.p., 980 r.p.m. slip-ring motor controlled by a stator oil switch and a water rotor resistance regulator

Because of the selectivity afforded by the double-deck screen all the material on the subsequent two-screen flow line of the smaller sizes passes through the screens ready for despatch. On the other flow line for the larger gradings, however, there are rejects which pass on by belt conveyor to further crushing plant. This is a Symonds Nordberg cone crusher driven by a G.E.C. 40 h.p., 575 r.p.m. slip-ring motor, inset just below floor level and pipe ventilated because of its situation. For similar reasons the rotor control in this case is effected by a drum type starter. The motor is directly connected to the crusher shaft.

Although by far the greater work of this motor is driving the crusher, it also serves a conveyor which feeds the crusher and an elevator which passes the material from the crusher to another pair of screens.

Multiple Screening

These two screens, which have driving arrangements much the same as the screens in the two lines immediately after the double-deck screen, pass the following grades of material: $\frac{1}{4}$in to dust, $\frac{3}{8}$in, $\frac{1}{2}$in and $\frac{3}{4}$in. Rejects from these screens are by-passed back to the Nordberg crusher. The $\frac{1}{4}$in to dust grade from these screens, together with the same grade passed through the double-deck screen, is passed on to another pair of screens. The latter are fed separately, however, and each one delivers the same three grades, namely, $\frac{1}{16}$in to dust, $\frac{1}{8}$in and $\frac{1}{4}$in. Each screen is driven by a 1½ h.p., s.c. Brook motor which is directly started and transmits power to the screen eccentric shaft by V-belt.

Some of the rock on the line to the double deck screen already referred to is by-passed to two other screens which represent the beginning of a tar plant. One of them is a triple-deck equipment and the other is a double-deck unit. In both cases the decks, three or two, operate together in a single structure. Both screens have off-balance flywheel agitation with even ratio V-belt transmission from a 12 h.p., s.r. motor in the case of the three-deck screen and similarly from a 10 h.p., s.r. motor in the case of the two-deck screen. For both screens together the gradings are $\frac{1}{8}$in to dust, $\frac{1}{4}$in, $\frac{3}{8}$in, $\frac{1}{2}$in and $\frac{3}{4}$in. Rejects from these screens are passed to another Pegson Gyrasphere crusher and recirculated to the screens. The crusher is driven by a C.P. 25 h.p., 960 r.p.m. slip-ring motor which transmits by a V-belt with a 2 to 1 ratio speed reduction to the machine shaft. Materials which pass through the screens are fed into hoppers where they are stored until they are required by the tar plant.

The five storage hoppers with different sizes of rock are so aligned that a travelling weighing hopper on a track immediately under the storage hoppers can be fed from any of the storage hoppers according to the size of rock required. The travelling hopper is a single motion (reversible) equipment, the motion being provided by a 2 h.p., s.c. direct starting motor under the control of an Allen West reversible push-button contactor starter. From the motor there is 4 to 1 belt transmission to a countershaft and then a 2 to 1 ratio chain drive on to one of the axles. There is a magnetic brake on the countershaft.

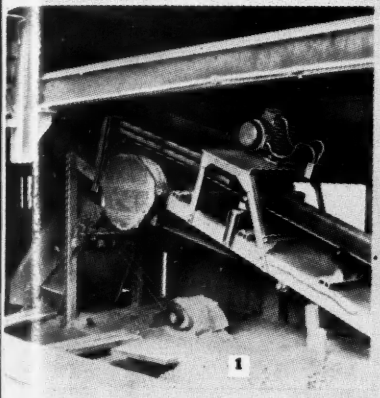
From the bottom of the travelling hopper the rock is passed on to either of two tar plants. To refer to one tar plant only, the hopper chute serves an inclined belt that feeds a bucket elevator, which passes the material on to a rotary crude-oil fired continuous dryer. The oil is fed to the burner by gravity, but just behind the actual burner an air stream from a small motor driven compressor, on site, joins the oil stream to aid combustion.

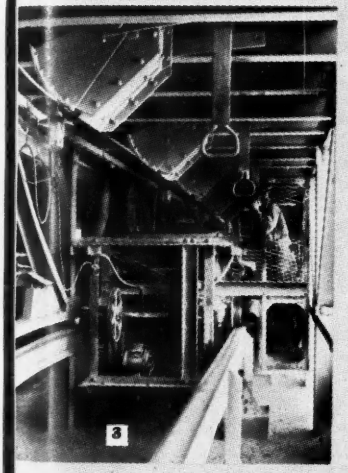
From the latter the rock goes directly to a bucket elevator which delivers it to elevated storage hoppers. As required, the rock is gravity fed down into the mixer via a weighing hopper. In the mixer are two lines of paddles driven by a 40 h.p., s.r. motor with a 6 to 1 ratio V-belt scheme and then with a similar reduction by a pinion gear on to one of the paddle shafts. The two shafts are engaged by an even ratio pinion gear transmission.

Binder Heating

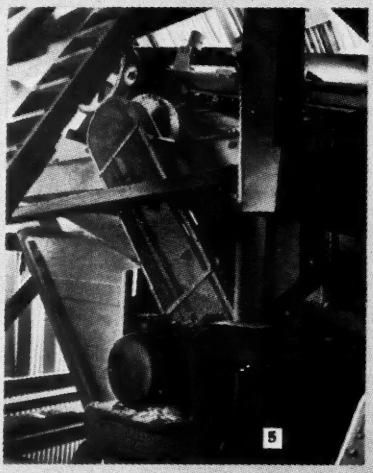
The resulting tar macadam is delivered directly from the mixer into lorries for despatch. The tar itself comes to the works in road tankers from which it is pumped into "Clarmac" storage tanks in which thermostatically controlled electric heating maintains the binder (tar and bitumen) at an essential consistency.

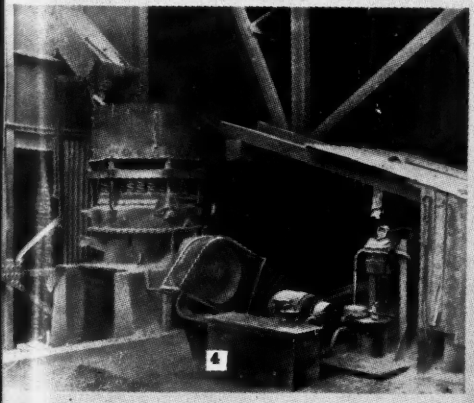
Each tank holds about 3,000 gall of binder and is equipped with fifteen horizontal 2 kW immersion heaters at the bottom of the tank. They are about 10ft long and the sheathing tubes are fixed, the elements being withdrawable. They are of

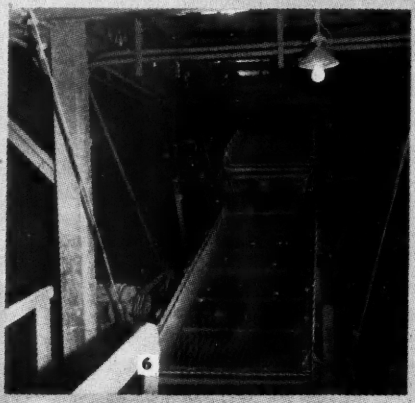


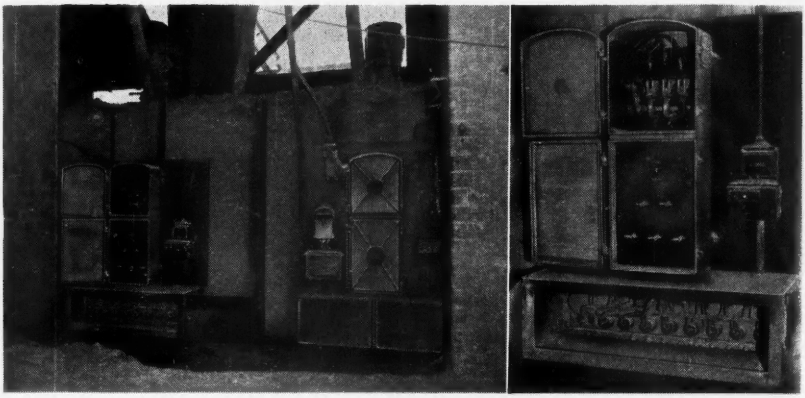


(1) Delivery conveyor to secondary crusher. (2) The scalping screen removes any dirt in the rock. (3) Serving the tar plant, a travelling weighing hopper receives rock from any of five aligned storage hoppers. (4) Rejects from the tar plant screens are dealt with by a rotary crusher. (5) Clean rock from the scalping screen goes to a double-deck vibrating screen. (6) In the flow lines served by the double-deck screen are two single deck screens operating in sequence









The binder storage tanks are each equipped with fifteen 2 kW immersion heaters arranged for switching in groups of three under master switch control

the normal metallic spiral type with central rod and disc spacer mountings, arranged for switching in five groups of three, but generally all 15 heaters of one tank are switched on and off under the thermostat control by a master switch. The normal temperatures at which the tar and bitumen are maintained range from 150 to 290 deg F.

In each of the binder tanks is a pump for delivering the tar to the mixing tanks. It is immersed in the tar and is directly driven by a 3 h.p. squirrel-cage reversible motor vertically mounted on the tar tank. The motor is direct-on started by a push-button contactor unit.

Electricity is supplied by the East Midlands Electricity Board and taken at 11 kV at the works substation and there reduced to 440 V by a 700 kVA transformer bank. On the l.v. side is a main circuit breaker and several English Electric feeder breakers made up as a switchboard with a common busbar. From the feeder breakers the distribution to the various parts of the works is by armoured cable laid underground in certain convenient cases, but mainly clamped to the plant and building structures. All the cables from the main switchboard are taken to one or another of several works distribution centres equipped with E.E. h.r.c. switchfuses.

From these centres armoured cables or v.i.r. cables in conduit are taken to the larger motor sites direct, where there are either switches and isolators or isolators only.

Smaller motors are fed through sub-distribution fuseboards. In all cases the motors have local individual isolators. Serving those parts of the works where the dust is thickest is a central dust extraction plant with a 30 h.p. slip-ring Brook motor driven fan, the motor being controlled by an Ellison starter.

We are indebted to Mr. W. D. MacKintosh, manager, Groby Granite Co., Ltd., for permission to visit the quarry and workings and to publish this article; and to Mr. L. T. Stanton, under manager, and members of his staff for help in obtaining the information and photographs.

Scientific Instrument Handbook

THE Scientific Instrument Manufacturers' Association has produced a new edition of its "Directory and Handbook." It is much larger than the previous edition and contains particulars of the 104 members of the Association, together with an index to about 2,500 different scientific instruments and their makers. Sir Ben Lockspeiser contributes a foreword; there is a survey of the growth of the scientific instrument making industry by Mr. R. S. Whipple; and some notes on the Association by the director, Mr. A. J. Philpot. Seven sectional articles deal with various branches of the art.

Copies of the handbook may be obtained from the Association at 20, Queen Anne Street, London, W.1.

B.E.A.'s Third Report

Electricity Supply in 1950–51

SINCE the nationalization of the electricity supply industry in 1948 the annual sales of electricity have risen by nearly a third; the increase in 1950–51 as compared with the previous year was 12·3 per cent. The actual figures as given in the British Electricity Authority's report for 1950–51 were 55,577 million kWh generated (13·1 per cent more) and 46,580 million kWh sold of which industry took about a half and domestic consumers a third. During the year about 450,000 new consumers were connected, raising the total to over 13 million of whom 11·5 million were domestic.

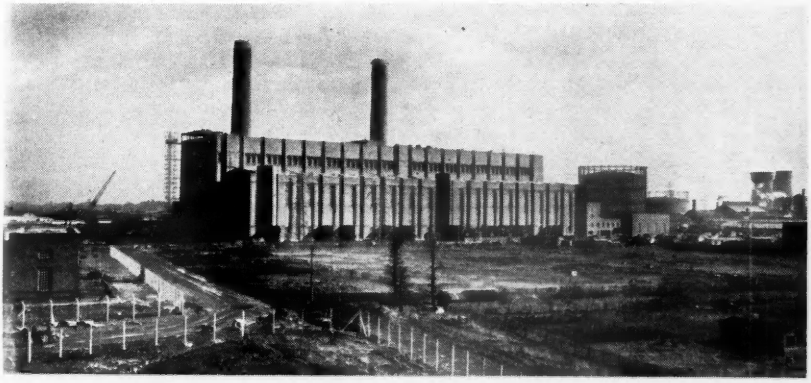
There was a surplus of £6·33 million on the combined revenue accounts of the Authority and the fourteen Electricity Boards, compared with £4·39 million in 1948–49 and £7·16 million in 1949–50. The Authority's surplus was £2·64 million.

The average revenue per kWh was 1·181d; this was 1·6 per cent below the 1949–50 average and 12·5 per cent above that of 1938–39. Actually the average price paid by domestic, commercial and small power consumers (1·463d) was 8·3 per cent below the pre-war average.

The average charge for large power supplies was 0·930d, against 0·925d in 1949–50, representing an increase of 0·54 per cent; it was nearly 40 per cent above the 1938–39 average. Charges for traction supplies averaged 0·925d (against 0·913d in 1949–50 and 0·587 in 1938–39) and those for public lighting 1·225d (against 1·217d in 1949–50 and 1·039d in 1938–39).

The percentage increases in the number of consumers of various classes and their purchases of electricity are set out in Table I and Table II analyses the sales by the Electricity Boards. The term "commercial consumers" covers a wide variety of premises, including shops, offices, warehouses, hospitals, schools, hotels and cinemas. The outstanding increase is seen to have been in sales to farm premises, 28·3 per cent, as compared with 1949–50 and 93·5 per cent since 1947–48.

In the last report it was shown that the sales to domestic consumers had risen by only 1·6 per cent during the year; in 1949–50 the increase on the previous year's sales was 12·0 per cent (22·5 per cent as compared with 1947–48). An increase in electricity sold for railway traction was accompanied by a similar proportional decrease in sales for street traction.



Croydon "B," one of the three large new power stations brought into commission during the year

Table I.—Consumers and Sales

Class	Number of consumers 31.3.51	Per cent inc. on 1949–50	Sale of electricity 1950–51 (million kWh)	Per cent inc. on 1949–50
Industrial	181,086	2·1	23,246	11·8
Commercial	1,266,705	3·1	5,917	16·7
Farm	109,962	9·9	480	28·3
Domestic	11,517,809	3·6	15,076	12·0
Traction				
Rail*	79	—	921	4·1
Street			524	−4·0
Public lighting	3,832	9·7	416	15·3
Totals†	13,079,473	3·6	46,580	12·3

* Including direct sales by the B.E.A.
† Excluding small supplies to N. of Scotland Board.

To meet rising costs the B.E.A. asked the Boards to submit proposals for tariff revisions; in some areas interim adjustments had to be made. In the matter of simplification and standardization the Boards made substantial progress in formulating new tariffs.

The effects of capital expenditure restrictions were not felt during the year and a record number of farms were connected—9,933, raising the total to 109,962. The restrictions will make it increasingly difficult to maintain this progress.

Finance

Ten of the fourteen Electricity Boards had surpluses on their trading accounts: they were the London Board (£1,069,936); South Eastern (£194,594); Southern (£782,694); Eastern (£95,652); East Midlands (£376,494); South Wales (£241,657); Merseyside and North Wales (£299,524); Yorkshire (£652,462); North Eastern (£90,184); and South East Scotland (£224,843). Deficits were shown by the South Western Board (£76,094); Midlands (£15,680); North Western (£138,187); and South West Scotland (£106,093). In the preceding year all the Boards made surpluses.

The total combined revenues of the Authority and Boards (including £229·21 million from the sale of electricity) were £236·98 million, against £214·46 (£207·35 from the sale of electricity) in 1949–50. This was equivalent to 1·221d/kWh (1·241d). Combined expenditures totalled £230·65 million (1·188d/kWh) against £207·30 (1·200d/kWh).

For the first time provision has been made for taxation. Liability for profits tax, estimated at £250,000, has arisen and the sum has been apportioned among the Authority and Boards. The liability would not have arisen if £6 million of the annual interest on British Electricity Stock had been allowed to be taken into account. To meet future liabilities a taxation reserve has been created with an initial contribution of £3·5 million.

The Authority has placed £1,300,000 of its surplus to the central reserve fund; eight Boards have contributed £686,000 and grants totalling £336,054 have been made to four Boards; thus the net addition to the fund is £1,649,946.

Table II.—Analysis of Electricity Boards' Sales

Board	Population (thousands)	Number of Consumers (thousands)	Sales of Electricity (thousands of kWh)						
			Domestic	Farm	Commercial	Industrial	Public lighting	Traction*	Total
London ..	5,168	1,606	1,870,420	338	1,190,967	1,192,311	79,072	94,063	4,427,171
S. Eastern ..	3,215	956	1,268,181	40,176	399,981	636,529	29,884	23,899	2,398,650
Southern ..	3,751	999	1,230,793	51,094	539,122	938,093	24,343	16,152	2,799,597
S. Western ..	2,125	577	668,800	32,100	246,400	425,100	14,200	—	1,386,600
Eastern ..	4,742	1,339	1,771,056	78,052	558,223	1,448,092	32,846	134,357	4,022,626
E. Midlands ..	3,668	1,000	1,183,413	45,857	309,554	1,963,742	21,304	25,845	3,549,715
Midlands ..	4,105	1,060	1,342,452	52,711	382,729	3,066,828	22,965	46,399	4,914,084
S. Wales ..	1,995	475	387,701	8,510	137,478	2,102,604	17,164	10,714	2,664,171
Mersey and N. Wales ..	2,838	704	801,032	32,491	396,568	1,711,675	19,282	88,859	3,049,907
Yorkshire ..	4,194	1,192	1,244,567	22,318	357,218	3,004,311	32,571	126,692	4,787,677
N. Eastern ..	2,988	757	619,908	16,341	284,726	2,050,639	19,557	73,135	3,064,306
N. Western ..	4,610	1,371	1,581,402	55,120	542,998	2,963,602	46,247	66,345	5,255,714
S.E. Scotland ..	1,351	333	324,841	12,499	165,904	453,185	14,933	34,031	1,005,393†
S.W. Scotland ..	2,592	708	781,822	32,765	405,293	1,288,703	41,499	—	2,550,082†
Totals	47,342	13,079	15,076,388	480,372	5,917,161	23,245,414	415,867	740,491	45,875,693

* Excluding 705 million kWh sold by B.E.A.
† Excluding small sales to N. of Scotland Board.

Table III.—Area Boards' Revenue and Expenditure

Board	Total Income		Total Expenditure		Net Surplus or *Deficit*	
	1949–50	1950–51	1949–50	1950–51	1949–50	1950–51
	£	£	£	£	£	£
London	30,735,776	30,527,960	28,834,686	29,458,024	1,901,090	1,069,936
South Eastern	13,972,183	15,422,525	13,549,560	15,227,931	422,623	194,594
Southern	16,190,054	18,110,076	15,269,831	17,327,382	920,223	782,694
South Western	7,605,638	8,421,091	7,604,854	8,497,185	784	— *76,094*
Eastern	20,617,972	23,196,130	20,183,789	23,100,478	434,183	95,652
East Midlands	15,618,959	17,145,125	14,746,420	16,768,631	872,539	376,494
Midlands	20,029,776	22,653,300	19,332,394	22,668,980	697,382	— *15,680*
South Wales	9,556,665	10,490,497	9,105,614	10,248,840	451,051	241,657
Merseyside and N. Wales ..	12,593,405	14,291,107	12,234,060	13,991,583	359,345	299,524
Yorkshire	19,022,748	20,725,436	17,692,061	20,072,974	1,330,687	652,462
North Eastern	12,165,758	13,193,338	11,636,986	13,103,154	528,772	90,184
North Western	22,169,312	21,887,636	21,551,773	25,025,823	617,539	— *138,187*
S.E. Scotland	4,597,367	5,138,038	4,130,428	4,913,195	466,939	224,843
S.W. Scotland	10,231,204	11,209,998	10,077,352	11,316,091	153,852	— *106,093*
Less inter-Board bulk supplies	*3,330,781*	*1,088,795*	*3,330,781*	*1,088,795*	—	—
Totals	211,776,036	234,323,462	202,619,027	230,631,476	9,157,009	3,691,986

The Authority's own accounts show a trading revenue of £148·88 million (against £128·10 million) made up as follows:—Sales to Boards £145·92 million (£125·37); sales to railways £2·53 million (£2·37); sale of steam £0·43 million (£0·36). Expenditure totalled £146·24 million (£130·09); it comprised generation costs £133·96 million (£117·58); purchase of electricity £1·25 million (£0·93); main transmission—operation, repairs and maintenance £1·31 million (£1·34); other costs £4·24 million (£4·72); administration and general expenses £3·31 million (£2·86); other expenses £2·17 million (£2·66). The surplus is thus £2·64 million, compared with a deficit of £1·99 million in 1949–50.

A table of the works costs of the Divisions shows that the weighted average was 0·4885/kWh against 0·4865d in 1949–50 and 0·4958d in 1948–49. The Yorkshire Division had the lowest cost (0·4078d) and the Southern Division the highest (0·5916d).

The Electricity Boards' accounts are summarized in Table III and their activities in installation work and the sale of fittings are shown in Table IV. Table V indicates the effect of fuel cost variation on the "unit" charge of the bulk supply tariff.

The consolidated balance sheet of the B.E.A. and Boards shows total assets of £770·85 million (against £683·56 million at the end of the preceding financial year); they included fixed assets of £636·85 million (£548·01 million). The total capital liabilities were £738·76 million (against £606·63 million), including £591·47 million of British Electricity Stock (£441·63 million) and obligations to local authorities amounting to £135·69 million net (against £147·93 million).

A chapter is devoted to employment and staff relations. In this it is stated that at

Table IV —Electrical Contracting and Sales of Fittings

Board	Sales		Direct Costs		Indirect Costs		Surplus	
	1949–50	1950–51	1949–50	1950–51	1949–50	1950–51	1949–50	1950–51
	£	£	£	£	£	£	£	£
London	1,874,617	2,223,250	1,525,325	1,816,750	285,056	342,596	64,236	63,904
South Eastern ..	1,535,700	1,937,264	1,231,064	1,519,951	285,481	345,533	19,155	71,780
Southern	2,254,203	2,498,391	1,823,086	2,014,626	357,371	423,595	73,746	60,170
South Western ..	1,213,817	1,553,159	927,216	1,214,026	276,915	336,893	9,686	2,240
Eastern	3,856,970	4,422,065	3,139,398	3,613,615	587,791	659,171	129,781	149,279
E. Midlands ..	1,442,644	1,603,112	1,166,572	1,282,425	178,032	206,420	98,040	114,267
Midlands	1,962,711	3,669,867	1,562,047	2,947,839	344,025	566,068	56,639	155,960
South Wales ..	753,689	833,286	619,718	700,737	101,445	119,190	32,526	13,359
Merseyside and N. Wales	920,501	1,225,592	733,690	985,707	176,625	209,697	10,186	30,188
Yorkshire ..	1,609,246	1,847,898	1,359,269	1,500,412	151,142	221,947	98,835	125,539
North Eastern ..	769,958	1,016,223	616,092	858,953	71,694	76,269	82,172	81,001
North Western ..	1,840,640	2,548,292	1,522,543	2,088,863	240,764	315,130	77,333	144,299
S.E. Scotland ..	384,718	487,303	297,941	379,138	58,323	75,705	28,454	32,460
S.W. Scotland ..	314,921	493,449	265,452	409,191	26,005	60,354	23,464	23,904
Totals ..	20,734,335	26,359,151	16,789,413	21,332,233	3,140,669	3,958,568	804,253	1,068,350

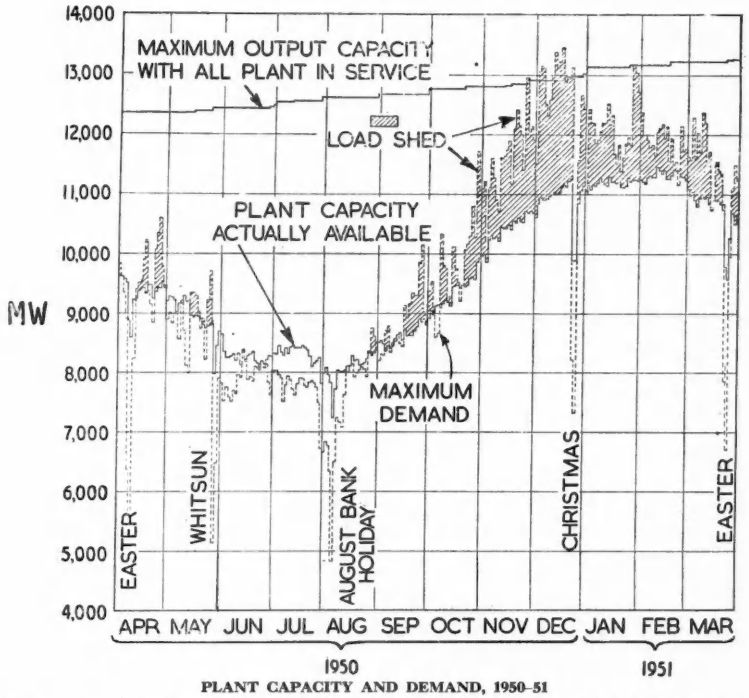
31st March last the Authority and Boards employed 176,200 people, 11·5 per cent of them women. Manual workers constituted 68 per cent of the total, the remainder being in the engineering, administrative and clerical grades. The increase over the preceding year's total (3·5 per cent) is held not to be large having regard to the growth of the authorities' work.

The negotiating " machinery " for terms and conditions of employment is briefly surveyed and the working of the Joint Advisory Councils is reviewed. Other subjects dealt with in this section are safety, health and welfare, and education and training.

Relations of the Authority and Boards with other organizations at home and abroad are touched upon. Referring to price discussions with manufacturing concerns, the report says that two associations of manufacturers accepted the principle of independent investigation of manufacturing costs incurred in typical contracts. The joint committees with the main manufacturers' associations continued their discussions of technical, commercial, price and administrative problems.

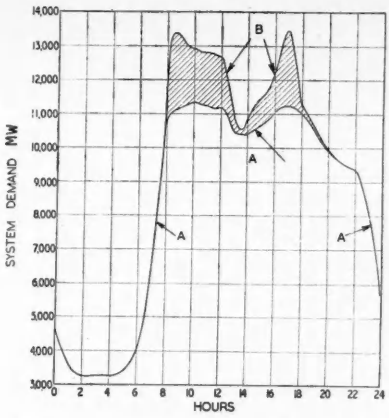
Particulars are given of ten schemes and an amendment to another scheme submitted for approval by the North of Scotland Hydro-Electric Board.

Work continued on the standardization of dimensions of equipment where interchangeability is desirable and on the rating and performance of equipment. With the Authority's and Boards' co-operation the British Standards Institution published standards for vacuum cleaners, refrigerators



PLANT CAPACITY AND DEMAND, 1950–51

The diagram shows for the half-hour of maximum demand of each day (excluding Saturdays and Sundays) the maximum output capacity of the plant installed, the output capacity of the plant available, and the demand actually supplied. For those days on which the whole demand could not be supplied, the diagram shows the quantity of load shed. The difference between the output capacity of the plant installed and the capacity available is accounted for by breakdown, overhaul, unsuitable fuel and other causes



VARIATION OF SYSTEM DEMAND ON MONDAY, 18th DECEMBER, 1950

(Day of maximum potential demand in 1950–51)
A. Demand actually met. B (shaded area). Demand shed

and food freezers and draft standards for street-lighting lanterns, cable sockets, composite switch and fuse units (industrial and domestic) and minimum requirements for electrical appliances and accessories. Draft standards were completed for irons and heating pads and work was started on others for domestic toasters, electric blankets, discharge-lamp auxiliary gear and cartridge fuses for use in plugs. A committee was set up, comprising representatives of the B.E.A. and Boards, E.D.A. and B.E.A.M.A., to foster improvements in cooker design, including interchangeability and reduction of maintenance costs.

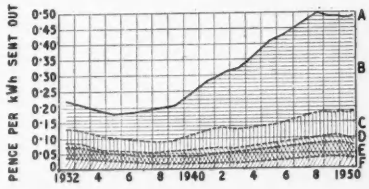
Regular meetings of Board and contractor representatives were held in most of the Areas in connection with the 1949 statement of principles governing the conduct of electrical contracting and retailing. By the end of the year, the Organizing Committee appointed to arrange for a National Inspection Council for Electrical Installation Contracting had nearly completed its report. Good progress was made by the Working Party set up by the B.E.A. to consider a minimum code of wiring practice.

Reference is made in the report to the change made in the Electrical Fair Trading Policy providing for additional discounts where special services are rendered to manufacturer with wholesaler. Evidence was given on behalf of the Authority and Boards at the inquiries into the electric lamp and cable industries by the Monopolies Commission.

Several reports were prepared during the year by the Utilization Research Committee, the subjects including the estimating of maximum demands on which to base the designs of new residential distribution systems; thermal storage apparatus in dwellings; and the characteristics of certain types of commercial and domestic loads.

Extended attention is given in the report to the control of consumers' loads. Various proposals are considered and it is concluded that as load-control devices cannot be arbitrarily imposed upon consumers endeavours should be made to secure voluntary acceptance of control by some form of tariff inducement. Large-scale tests are being made in Merseyside and South West Scotland to secure evidence on a number of points.

Under the heading " Design and Development " mention is made of provisional orders placed with British manufacturers for a substantial number of 275 kV circuit breakers and the manufacture and testing of prototypes. They will have a short-circuit rating of 7,500 MVA; they will be of both bulk-oil and air-blast types. Specifications and inquiries were sent out for seventeen 120 MVA 132/275 kV auto-transformers of two types: one with tap-changing equipment insulated for operation at 132 kV and the other with the tap-changer connected for operation at the



AVERAGE WORKS COSTS OF PRODUCTION AT STEAM POWER STATIONS, 1932–51

(Twelve-months' running averages all figures plotted at middle of period)
A. Total works costs. B. Fuel, excluding transport. C. Fuel transport. D. Fuel handling. E. Repairs, maintenance, oil, water and stores. F. Operation salaries and wages

The diagram shows the average works costs per unit of electricity sent out during the years ended 31st December, 1932–47, and on the last day of each quarter in subsequent years. To 31st March, 1948, the diagram relates to steam stations the output of which was under the control of the former Central Electricity Board, and thereafter to the steam stations owned by the Central Authority

earthed neutral end of the transformer windings. Among 570 transformers in the main transmission system there were 56 breakdowns involving disconnection. Of these eight were winding faults, two core faults, twelve electrical breakdowns in tap-changing equipment and 34 mechanical or control-circuit faults in tap changers.

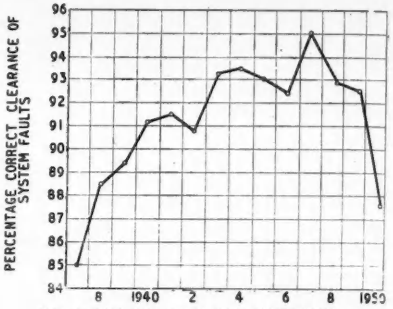
Discussions with the manufacturers continued on the Authority's future limited requirements of 275 kV cables. A cable laid from Barking power station to the new Ilford 132/33 kV transforming station is the first large installation of three-core single-lead-sheathed 132 kV gasfilled cable in the world. Designs were prepared for 275 kV lines of both twin 0·175 sq in and twin 0·4 sq in steel-cored aluminium conductors per phase. For limited bulk supplies in sparsely populated areas designs have been prepared for a 132 kV single-circuit wood-pole line without overhead earth conductor. Work has proceeded on the design and testing of towers for the 275 kV lines.

The number of system faults was reduced from 660 in 1949–50 to 352 in the year under review. This was partly attributable to the transfer of 66 kV and lower voltage lines to the Boards and also to freedom from faults arising from adverse weather.

Particulars are given of various lines of engineering research which are being pursued. These now include district heating (the Pimlico installation); experiments on the practicability of a type of thermo-dynamic cycle in which the prime mover resembles a gas turbine in construction although steam operated; and the economic prospects of wind-power generation. Measurements continued of power losses on the experimental line at Leatherhead (operated throughout the year at 250–300 kV). Other subjects of research included surge phenomena, insulating materials, earthing electrodes, cooling towers and fuel cells.

Generating Plant

At 31st March, 1951, the installed capacity of the 289 power stations owned by the Authority was 14,592 MW; and the effective capacity, assuming all plant in service, was 13,156 MW (sent out). New plant brought into service during the year gave an additional capacity of 918 MW—a much greater increase than in any previous year. Taking into account the shutting down of some unserviceable plant, and the removal of old plant to make room for new, the net increase in capacity was 819 MW.



PROTECTIVE GEAR PERFORMANCE

The diagram shows the yearly average percentages of system faults correctly cleared for the calendar years 1937–47 and for the years ended 31st March, 1949–51, plotted at mid-year. The performance data regarding power station switchgear, much of which is of old or obsolete design, was included for the first time in 1949–50, and as a result the number of circuit-breaker operations on which the assessment is based was two-and-a-half times greater than in 1948–49

Over one-third of the number of generating sets and boilers, representing about 13 per cent of the total generating and steaming capacities, are 25 years old or more. This relatively inefficient plant has to be kept in service because of the continuing plant shortage, especially for use during peak periods.

Peak Demand

The maximum potential demand on the system occurred on 18th December, 1950. One of the curves shows, as an average over the half-hour of maximum demand in that day and in the previous two winters, the output of the power stations, the estimated load shed and the estimated "potential" maximum demand, i.e., the demand that would have occurred if there had been no reduction of load due to load shedding. The estimated potential maximum demand in 1950–51 was 1,166 MW higher than that in 1949–50.

During the year reviewed three new power stations were brought into partial operation, Croydon "B," Agecroft "H.P." (Salford) and Poole. At the end of the year, 43 new power stations and 31 extensions to existing stations were under construction or planned in the construction programmes up to and including that

for 1956. Power station capital contracts approved by the Authority in 1950–51 amounted to £85 million, compared with £68 million in 1949–50. The average cost of new stations is about £50/kW or three times as much as before the war.

General delays in the post-war construction of new power stations and extensions through shortages of labour and materials and other causes, have been aggravated by "bottlenecks" in particular products.

The principal cause of delay has been the provision of boilers. Arrangements have been made with a leading engineering firm for the manufacture of boilers of the largest sizes, and contracts for smaller units have been placed with firms which have not in the past undertaken such work. Nine firms will be supplying boilers in future, whereas there were only five in the 1945–50 period.

Other measures to speed construction include the fabrication of high-pressure pipework by a well-known firm not formerly associated with this class of work; arrangements for the fabrication of high pressure steam pipework in Germany; and the placing of orders in Italy for a bulk supply of low-pressure valves of which there was a serious shortage. At one period when a shortage of boiler tubes was holding up the production of boilers the Authority purchased several thousand tons from Germany.

Generation Costs

All but 1 per cent of the electricity generated by the Authority comes from steam stations. There was a further improvement in overall thermal efficiency of the steam plants to 21·54 per cent, as compared with 20·86 per cent in 1947–48 and 21·33 per cent in 1949–50. There was a consequent reduction in coal consumption per kWh from 1·468 lb to 1·447 lb. In spite of this, increases in fuel and transport costs raised the average works cost per kWh sent out from 0·4872d to 0·4894d.

The average delivered cost per ton of British coal was 13·6 per cent higher in March, 1951, than in April, 1950.

Over 33½ million tons of fuel, including 32½ million tons of coal, was consumed during the year. While total fuel consumption rose by 11·5 per cent the corresponding increase in electricity generated was 13·1 per cent.

Table V.—Effect of Fuel Cost Variation on "Unit" Charge Component of Bulk Supply Tariff

Board	Bulk Supply tariff fuel cost per ton	Price per kWh
	s. d.	d.
London	61 4	0·5310
South Eastern	61 5	0·5317
Southern	63 0	0·5450
South Western	58 4	0·5058
Eastern	61 7	0·5331
East Midlands	47 3	0·4127
Midlands	54 0	0·4694
South Wales	43 0	0·3770
Merseyside and N. Wales	54 10	0·4764
Yorkshire	46 6	0·4064
North Eastern	47 5	0·4141
North Western	52 7	0·4576
S.E. Scotland	52 8	0·4582
S.W. Scotland	55 11	0·4855

At the close of the year the grid comprised 4,506 route miles of main transmission lines and cables, 4,037 miles operated at 132 kV and the remainder at 66 kV or less.

The major transmission works put in hand during the year included 265 route miles of 132 kV overhead lines and about 371 route miles of the new 275 kV "supergrid," comprising sections between West Melton (Sheffield) and Clyde's Mill (Glasgow), and between Tilbury and Elstree.*

To meet the rapidly growing load, and to strengthen existing distribution arrangements, 23 new grid points of supply to Area Boards were agreed. It was estimated that the provision of these additional supply points would show a saving of about £1¾ million upon the costs which would have been incurred in developing existing points of supply under pre-vesting conditions. The aggregate savings from such schemes approved in the three years since vesting day are claimed to amount to about £4·7 million.

Future Plans

Early in 1950 it was agreed in consultation with manufacturers that it would be possible to bring new generating plant into operation at increasing rates, as follows:—Calendar year 1951, 1,000–1,250 MW (s.o.); 1952, 1,150–1,400 MW; 1953, 1,300–1,500 MW; 1954, 1,400–1,600 MW; 1955, 1,500–1,700 MW; and 1956 onwards 1,600–1,800 MW.

For each year the lower amount was

* A map appears in Sir John Hacking's I.E.E. presidential addres. (p. 784)

that which could be expected with confidence, and the higher amount was that which should be possible if nothing untoward affected existing plans. If the higher rates of installation are achieved, and the growth in demand does not exceed the estimates, the shedding of load by switching-off consumers should be comparatively infrequent by the winter of 1954–55 and very exceptional in the three following winters. Reductions in frequency and voltage, to a diminishing extent, would still occur.

This forecast was made before the launching of the rearmament programme and the deterioration in supplies of raw materials. By the end of 1950–51 there were already indications that plant manufacture and building construction were being adversely affected. Moreover, the forecast did not allow for any exceptional increase in the industrial demand for electricity such as must result from rearmament.

The Authority says that it is convinced that, in the changed circumstances, the planned rates of new plant capacity cannot be achieved unless first preference is given to the manufacture of power plant and equipment and to power station construction. Even if this were conceded and the planned rates are achieved, it will take several years to effect a substantial reduction in load shedding.

The Authority fully recognizes the country's difficult economic situation but it is seriously concerned about the proposal by the Government, in apportioning national capital investment, that the annual installation of new generating plant should not rise above 1,500 MW compared with the estimated requirement and present aim of 1,800 MW. It says that the proposed limit on the amounts of new plant would not merely prolong the conditions of severe plant shortage and severe load shedding, it would also hinder that greater mechanization and extended use of power in industry which can make the most effective contribution to improved industrial efficiency.

Resale Price Maintenance

Fair Trading Council's Statement

IT was stated in the recent White Paper on Resale Price Maintenance (Cmd. 8274) that the Government, in drafting legislation on the subject, would take account of any exceptional conditions which might make the proposed provisions unworkable or undesirable in the public interest.

The Electrical Fair Trading Council has now prepared a statement showing that " exceptional conditions " apply to electrical products and is submitting to the Board of Trade a case for the exclusion of electrical products from any legislation which may be introduced.

It is denied that the regulation of trading relations in the electrical industry has resulted in higher prices or that unrestricted competition would be in the public interest.

The Council points out that the electrical industry is a highly-developed technical industry engaged in the production and distribution of a wide range of technical products.

The maintenance of quality and workmanship has been essential to the export trade and this has involved much costly research and development. Electrical products made to the appropriate standards are safe but it is important that the public should obtain them through technically competent retailers and contractors who will give advice and service. Such a body of distributors can be created and maintained only by ensuring them a return sufficient to cover the cost of training and providing qualified staffs. It is contrary to the interest of the public that goods should be obtainable at cut prices which make it impossible to give essential technical service.

Price-cutting among retailers inevitably has detrimental effects upon the manufacturing side; any lowering of standards of quality would have a lamentable effect in both home and export markets.

The Council considers that the security of employment and the training of technically skilled workers (who form a useful " reservoir " in times of emergency) would be endangered if the legislation envisaged in the White Paper were applied to the electrical industry.

In conclusion the Council stresses the voluntary nature of its operations and says that none is denied entry to the electrical industry although the Electrical Fair Trading Policy establishes the essential qualifications for those engaged in the distribution of electrical products.

Copies of the statement can be obtained gratis from the Council at Sardinia House, Sardinia Street, London, W.C.2.

I.E.E. Presidential Address

Generation and Transmission Developments

SOME of the more important recent developments in the generation and main transmission of electricity were reviewed by Sir John Hacking, deputy chairman (operation), B.E.A., in his presidential address to the Institution of Electrical Engineers last week in London.

The address commenced with comparisons: tabulated data indicated that the growth of public supply in Great Britain during the ten years ended 1949 represented an increase of 83 per cent, exceeded only by Switzerland, Sweden and the United States. All energy supplied (both publicly and privately produced) increased by 64 per cent, which was similar to the total in Switzerland, not much greater than those in the Netherlands, France, Norway and Belgium, though substantially greater than in Italy and Western Germany, but less than in Sweden and much less than in the United States.

There had been a marked increase in most countries in the proportion of the total consumption attributable to the "agriculture, shops and offices, domestic, public lighting and small power" group of consumers. The proportional consumption of this group in Britain, at 40 per cent of the total, was in 1949 the third highest of ten countries. The total energy supplied per head of population in Britain was rather greater than in the principal industrial countries of Western Europe, but substantially less than in Switzerland, Scandinavian countries and the United States.

Sir John then turned to reasons for power deficiency in this country. Although data were not always complete the graphs (Fig. 1) were believed to be substantially accurate and comparable. They showed that the rate of power station construction had lagged after the war in Britain, while some Continental countries had made use of Marshall Aid funds for purchasing American power plant.

Although data were again incomplete it appeared that station thermal efficiency was some 3·6 per cent better in Great

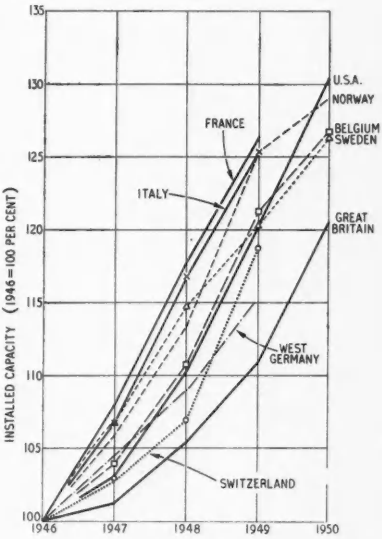


Fig. 1. Nine-nation rates of increase of installed plant capacity

Britain than in France but that between 1947 and 1950 improvement of thermal efficiency in America had been greater than in Great Britain. Had it been possible to replace by new plant 1,000 MW of the old plant of lowest efficiency the average thermal efficiency would have been increased to 23 per cent with a consequential saving of nearly 2 million tons of coal a year. It was pointed out that the numbers of turbo-alternators and boilers comprising the present B.E.A. programmes were considerably less than the numbers that were being installed over 20 years ago. Sir John suggested that with the increasing capacity of units the overall effort on the part of all concerned in carrying out the generating plant programmes was not necessarily proportional to the size of the programmes. He said he was convinced that, provided the necessary materials could be made available, the programmes now in hand

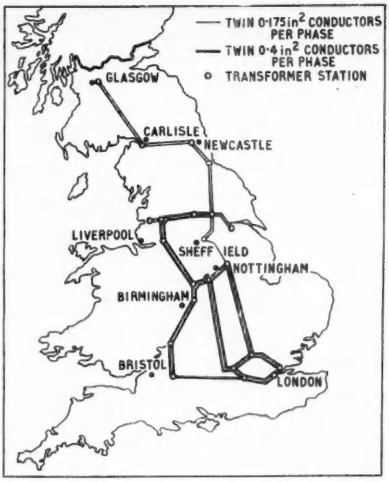


Fig. 2. Outline routes of 275/300 kV super-grid scheme for 1960

and even larger future programmes were well within the capacity of the manufacturers and of design staffs of the B.E.A. and the consulting engineers. But the rearmament programme at present was seriously increasing the difficulties of obtaining materials. It was essential that those difficulties should be removed if the generating plant programmes were to be achieved.

The " unit " boiler arrangement was being adopted for more than one-third of a total 13,000 MW programme, which comprised 97 individual sets and boilers, including 50 of 60 MW capacity and five of 100 MW capacity. Over 70 per cent of the total programme would employ pulverized fuel which was at present the only practical method of firing the large boilers required for the " unit " arrangement.

Recent studies had indicated that by placing the primary steam superheater sections in the radiant heat zone of the boiler, or by using tilting pulverized fuel burners, both of which permitted better control of steam temperature, " unit " boilers for 100 MW sets using reheating were now feasible. One of the new stations had been designed for these conditions and others were being planned. In all cases, however, it was proposed to limit temperature to just below 1,000 deg F in order to permit a freer use of ferritic alloys in the boilers.

Three gas-turbine plants would be commissioned this year and potential non-normal thermal cycle developments were being closely studied. The North of Scotland Hydro-Electric Board was at present supplying to the B.E.A. 165 MW, but was expected ultimately to supply 500 MW.

The Super-Grid

Turning to power transmission developments, Sir John confined himself to the future 275/300 kV super-grid scheme with one major exception which was that of co-ordinated planning of the existing 132 kV grid system. It was now possible to consider the best method of satisfying requirements from the point of view of overall economy, irrespective of which party had to bear the capital expenditure involved. More than 40 new 132 kV grid supply points had been established, or agreed, in the last three years compared with only seven during the previous five years.

For nearly thirteen years the existing grid had been performing a function for which it was not designed, namely, the national pooling of generating plant as distinct from regional pooling. The increasing post-war needs to transfer power from one part of the country to another had stressed the existing grid far more heavily than during the war. To return the grid to its original character while maintaining the present degree of safety would necessitate four times as great a capacity. To abandon national operation and revert to the original conception of a number of areas operating independently would require an estimated 5 per cent increase of generating plant, the capital cost of which would be much greater than that of superimposing a higher voltage grid on the existing 132 kV system.

Altogether about 1,000 miles of new line construction would be required (Fig. 2) the total estimated cost of the super-grid scheme being some £52 million at the prices ruling at the time of its adoption one year ago. A substantial part had been approved for completion by 1955 and work was actively in progress. As with the existing grid, the new grid would operate with solidly earthed neutral at each transforming point. All the equipment would be designed

for continuous operation initially up to 300 kV and to withstand an impulse test level of 1,050 kV. The address included some details of tower designs and conductor sizes; an important feature of the new tower design would be the use of a percentage of high tensile steel in order to keep the total weight of the smaller double-circuit tower about the same as that of the single-circuit tower employed on the Staythorpe–Sheffield experimental section, which was built wholely of mild steel. Extra clearances were being allowed on the towers carrying the larger conductors to permit a possible increase to 380/400 kV in future should that become practicable and economic.

Turning to the transmission of power in bulk over long distance, the President indicated by means of diagrams the transfers of energy which took place in 1949 between different zones, the latter corresponding with the present grid control areas. The diagrams indicated that the coal equivalent of the energy transferred electrically in this way was relatively insignificant in 1949. In 1960, however, it was forecast that some 70 per cent of the total energy exported from the mid-east and the central zones would be handled electrically.

The address concluded with some broad outlines of B.E.A. policy and intentions concerning research for and within the electricity supply industry.

Claim Against E.T.U.

THE hearing was continued last week by Mr. Justice Wynn-Parry of the claim by seven members of the Electrical Trades Union for declarations that a strike of electricians employed by the London Electricity Board was illegal; that its conduct was not in accordance with the Union's rules; that they were entitled to all rights and benefits of membership; and that the disbursement of £50,000 in strike pay was not in accordance with the rules. Injunctions were also sought restraining the Union from penalizing the plaintiffs for not taking part in the strike.

The defendants (the Union, Mr. W. C. Stevens, the general secretary, and seven other officials) denied that they had threatened the plaintiffs and contended that they had acted in accordance with the Union's rules.

Mr. Kenneth Diplock, K.C., said that the promotion of a non-member of the Union to be an electrician's mate, which was the cause of the stoppage, struck at the roots of the principle for which the Union had fought for years: the right to be the sole negotiators for all electricians in the electrical contracting industry.

Counsel said that he was not contending that the strike was other than an unofficial one which members were entitled to support or refrain from supporting. He agreed that the Union had no right to impose penalties on the plaintiffs and he was prepared to repeat the undertaking already given to this effect.

Mr. Justice Wynn-Parry expressed his opinion that the case had been a waste of time as the Order (No. 1305) under which it was claimed that the strike was illegal had been annulled.

Later Mr. Dennis Gerrard, K.C. (for the plaintiffs), said that he would not proceed with the claim that the strike was illegal but he would still ask for a declaration that the £50,000 paid out was against the rules of the Union.

Mr. Diplock said that the Executive Council of the Union considered that it had the right to make payments to members out of work for whatever reason. The Union had a rule entitling it to make payments to any members in sickness or distress.

Mr. Gerrard would not accept the suggestion that the term "distress" covered men on strike.

At the conclusion of the proceedings his Lordship reserved judgment.

Keeping Electricity Safe

THE safety of electrical equipment was considered by Mr. K. C. Pounds in his inaugural address as chairman of the London Students' Section of the Institution of Electrical Engineers. Although the number of fatal electrical accidents was low when taking into account the widespread use of electricity, a survey of their causes gave him the impression that the majority were avoidable. In view of this he enumerated some of the more common causes of electrical accidents and analysed the various reasons for their occurrence as he felt that the professional electrical engineer, by offering advice based on the critical examination of particular installations, could do much to make the application of electrical power in both factory and home even safer than it was at the present time.

As the greater part of the address was concerned with electricity in industry, Mr. Pounds commenced with a summary of the relevant legal requirements after which he dealt with earthing in the factory. Portable tools and electronic apparatus were then considered and attention was also given to electricity in the home.

VIEWS on the NEWS

By REFLECTOR

ALTHOUGH it cannot be denied that the electric fire has been responsible for much of the supply industry's peak troubles, I consider that Mr. Noel-Baker went too far in his condemnation last week. The Minister apparently regards the electric fire as wholly evil when, in fact, it is a most useful and convenient appliance. If people could be persuaded to use it only when there is ample power (which means in the evening and very early morning) there would be no objections from the electricity supply authorities. As it is, they are compelled to frown upon the electric fire: they dare not be seen to encourage it.

* * *

I think, too, that there was some "wishful thinking" about Mr. Noel-Baker's statement that in many parts of the country it is becoming difficult to buy electric fires. Wherever I go I see them in the windows of electrical (and other) retailers and not all the Electricity Boards have banned them. The *Manchester Guardian* supports this view, saying that in the Manchester showrooms of the North Western Board several types of fires were on display last week and they were on sale to anyone. Other retailers of electric heating devices in Manchester and suburbs said that they had electric fires for sale.

* * *

Remembering what has been said in the lay Press in recent months about the iniquitous rises in the price of electricity, I am both amused and amazed that some newspapers are now complaining that electricity is too cheap. The consequence, it is said, is that the B.E.A. is overwhelmed at peak times and has to institute power cuts. As I have said before, if a prohibitive price were charged electricity would still be used in peak hours, any "economy" being made at other times. Particular criticism is directed by the *Observer* to the two-part tariff which, it says, is "still often absurdly designed to reward extravagance by charging less for current after a certain amount has been used." The general complaint is that the fixed charge, or initial "step," makes the overall cost per unit far too high for many consumers.

* * *

A suggestion by Mr. R. A. S. Thwaites, deputy-chairman of the North Western Electricity Board, seems to have fallen on chilly ground. He said that earlier rising would enable people to keep clear of the morning peak and prevent power cuts. As an early riser myself I see little hardship in getting breakfast over by 8 a.m., but I can appreciate the resentment of those who have formed other habits. One "local office worker" interviewed by the *Southport Journal* is of the opinion that "it is just a gag to get people to work on time." Laudable as this may be I do not think that it is really what Mr. Thwaites had in mind.

* * *

The Government, which always knows what is good for us, has placed electric immersion heaters in the "luxury" class by imposing on them a 100 per cent purchase tax. Either because they are thus made so expensive or because the Government's view is shared by the Hampstead Housing Committee, it has been decided not to install immersion heaters in some Council flats. The tenants say that they were promised the heaters, which is denied. The *Hampstead News* reports the housing manager as telling tenants:—"When your rents are subsidized by people living in worse conditions than you it does not make sense that you should be provided with luxury items."

* * *

Mr. E. L. Morland, who has just retired from the position of Sub-Area engineer with the Merseyside and North Wales Electricity Board, appears to have earned the affection and goodwill of his staff. Upon his retirement, he says in a letter to the *Sunday Express*, they gave him a 10 h.p. saloon car, a television set, two season tickets for the North Wales touring steamers and a pistol in a beautifully polished case. (Mr. Morland is an expert shot.) Not many retirements are so well provided for.

PERSONAL and SOCIAL

News of Men and Women of the Industry

THE Minister of Fuel and Power has re-appointed the following chairmen of Electricity Consultative Councils in Scotland :—South East Scotland : **Mr. J. M. Airlie** (Edinburgh); South West Scotland : **Mr. A. B. Mackay** (Glasgow).

Mr. T. G. Baird, A.M.I.E.E., has been appointed assistant to the system construction engineer in the Transvaal area of the Electricity Supply Commission of the Union of South Africa, and leaves this country for Johannesburg on 6th December. Mr. Baird obtained his training with the British Thomson Houston Co., Ltd., and joined the Central Electricity Board in 1932, subsequently becoming section engineer at Bedford. In 1948, Mr. Baird was appointed second assistant transmission engineer in the Eastern Division of the British Electricity Authority, and in 1950 became senior assistant co-ordinating engineer in the Transmission Department of the Chief Engineer's Department.

We are sorry to hear from **Mr. J. F. Stanley,** British Standards Institution, that he has entered hospital for an operation and expects to be absent from his office for about a month.

The Metropolitan-Vickers Electrical Co., Ltd., announces that on 1st September **Mr. S. A. Ghalib** was appointed assistant chief engineer, Electronic Control Department. Mr. Ghalib was born in Cyprus and educated at Victoria College, Alexandria, and University College, London. Following a college apprenticeship at M-V from 1935 to 1937 he joined the Traction Sales Department. Early in the war he was transferred to the railway signals engineering section, and during the war he was engaged on remote power control of gun mountings. He joined the Electronic Control Department on its formation in 1945, since when he has been responsible for the application of electronic control and the associated mechanical devices to industry, as well as to equipment for the fighting services. In 1949 he was appointed engineer-in-charge of the Department. Mr. Ghalib is a member of the Ministry of Supply Technical Committee on servo mechanisms.

Mr. S. A. Ghalib

Miss Hermione S. O'B. Hoare has resigned from her position as publicity manager of Ferranti, Ltd., as she has recently become engaged to be married. Miss Hoare obtained an honours degree in modern languages at Oxford University in 1940. She joined Ferranti, Ltd., in 1942 in the Government Contracts Department and was appointed publicity manager in 1945. Miss Hoare was one of the original members of the B.E.A.M.A. Publicity Committee and thus became the only woman ever to have sat on a B.E.A.M.A. Committee. She was also a member of the B.I.F. Electrical Exhibitors' Committee and the I.A.M.A. Technical Advertising Committee. Miss Hoare is succeeded as Ferranti's publicity manager by **Mr. W. N. Duffy.**

Miss Hermione Hoare

Mr. W. N. Duffy

Mr. H. C. Skinner has relinquished his appointment with Charles F. Higham, Ltd., advertising agents, to take up a position as controller of trade press advertising with L. D. Group Publicity, who, under the management of Mr. W. L. Allison, are responsible for the publicity of all the subsidiary companies of Lancashire Dynamo Holdings, Ltd.

At the annual general meeting of the Widnes Foundry & Engineering Co., Ltd., held recently, **Mr. R. Credland,** assistant managing director of the company for the past four years, was appointed joint managing director. Widnes Foundry is one of the Thos. W. Ward group of companies.

The Duke of Edinburgh, K.G., F.R.S., has accepted honorary membership of the British Institution of Radio Engineers.

Mr. G. D. Clifford, secretary of the British Institution of Radio Engineers, has been invited to spend some time in India for the main purpose of establishing Sections of the Institution to be operated under an Indian Advisory Committee. The Government of India has given all possible help in arranging the visit which has been sponsored by the Ministry of Natural Resources and Scientific Research.

Mr. E. J. Wilson, until recently the assistant engineer to the Port of London Authority, has been appointed London office manager of Richard Sutcliffe, Ltd.

Mr. F. E. Buckell, A.F.R.Ae.S., A.F.I.Ae.S., manager of the Aeronautical Department of the General Electric Co., Ltd., is visiting the United States and Canada for meetings dealing with airfield lighting and landing aids.

Mr. F. W. Halliwell, M.I.Mech.E., M.I.Prod.E., chairman and managing director of Gay's (Hampton), Ltd., has been elected president of the Gauge and Tool Makers' Association for 1951-52, and **Mr. H. S. Holden,** M.I.Prod.E., has been elected chairman.

Major J. V. Holman has resigned from the board of the Radio & Television Trust, Ltd.

Gen. Sir William D. Morgan and **Mr. A. F. Street** have joined the board of Siemens Bros. & Co., Ltd.

On 26th September the British Empire Medal was presented to **Mr. F. A. Lovett,** superintendent of the insulation, varnish, stove enamel, and resin factories of the British Thomson-Houston Co., Ltd., Rugby, by Lord Willoughby de Broke, Lord Lieutenant of Warwickshire.

Mr. S. R. Williams has been elected a director of Worthington-Simpson, Ltd.

The annual **Liverpool-Manchester Electrical Trades' Golf Match** took place at Mere on 10th October. The match consisted of eight four-ball games, which resulted in a win for Liverpool by 5½ games to 2½. This year it was the manufacturers' turn to captain the sides and Manchester was led by Mr. E. G. Taylor (G.E.C.), and Mr. K. R. Mackley (Cryselco, Ltd.) was the non-playing captain of the Liverpool side. Mr. B. T. Hawkins, former borough electrical engineer of Wallasey, who has for many years been the independent chairman of the joint Manchester and Liverpool Committees, presided at the dinner, and afterwards presented the captain of the winning side with the handsome trophy which was given in 1937 by the late Mr. J. H. Farthing (G.E.C.).

In accordance with long-standing practice, the Council of the **Electrical Wholesalers' Federation** recently held one of its meetings in Scotland. On this occasion the venue was the Turnberry Hotel, Ayrshire. Invitations were issued to members of the R.E.C.M.F. and the E.L.M.A. negotiating committees and their wives to participate.

Two prizes were presented by the president (Mr. George Cartwright) for a golf competition. The winners were Mr. Bunting (R.E.C.M.F.) and Mr. W. H. Swain (E.W.F.). In addition these two players shared the honour of being the first joint winners of the Scottish members' cup.

The grand finale was a dinner given by the Scottish members under the chairmanship of Mr. J. Kinloch, when 80 members and guests were present. Mr. Kinloch proposed the health of the E.L.M.A., R.E.C.M.F. and E.W.F. Mr. Broughton Pipkin (chairman, R.E.C.M.F.), Mr. Cecil Hughes (chairman, E.L.M.A.) and Mr. Cartwright responded. Mr. E. A. V. Peckham proposed the toast of the ladies and Mr. A. Glenister responded on their behalf. After dinner there was dancing until a late hour.

The New Brighton Tower was packed to capacity on 12th October when 2,300 members of the staff of **British Insulated Callender's Cables, Ltd.,** held an enjoyable party. They came from all factories of the company's northern group, and for their conveyance to and from New Brighton it was necessary to hire seventy coaches. Supper was served in the Tower ballroom and on the ballroom balcony. A vote of thanks was accorded to the directors by Mr. W. L. Campbell (chairman of the Staff Association), and a brief reply was made by Sir Alexander Roger, K.C.I.E. (chairman of B.I.C.C.). For the rest of the evening there was a comprehensive programme for all ages and tastes. There was dancing in the ballroom and film and variety entertainments were given in the theatre by a number of well-known stage and radio artists. The Fun Fair was also open to the staff.

A supper dance and cabaret was held by **Chloride Batteries, Ltd.,** for nearly 600 West Country motor and radio traders and their ladies at the Berkeley Restaurant, Bristol, on 8th October. The guests were greeted by Mr. F. Atkinson, manager of the Exide depot in Bristol.

Well over two hundred people spent an enjoyable evening at Victoria Halls, Bloomsbury Square, on Friday, 12th October, when the London Students' Section of the **Institution of Electrical Engineers** held their annual autumn dance. Among the guests were Sir John Hacking, President of the I.E.E., accompanied by Lady Hacking, Mr. Brasher, secretary, I.E.E., with Mrs. Brasher, Mr. Ratcliffe, I.E.E. staff, and Mrs. Ratcliffe.

During the evening Sir John, introduced by Mr. K. C. Pounds (chairman), spoke of the importance the Council attached to the Student Section functions and wished them well.

OBITUARY

Mr. H. S. Seccombe.—The death occurred on 7th October, after a short illness, of Mr. H. S. Seccombe, who had been chairman and managing director of Electrical Components, Ltd., for over thirty years. He was sixty-two years of age.

Mr. V. W. Bone.—The death occurred on 12th October at the age of sixty-eight of Mr. Victor William Bone, late chairman and managing director of Ruston & Hornsby, Ltd., and formerly managing director of Ruston Bucyrus, Ltd. Until his retirement in June, 1949, Mr. Bone had been connected with Ruston & Hornsby and its associated companies all his business life. He succeeded Mr. G. R. Sharpley as managing director of Ruston & Hornsby in 1943, and was elected chairman of the company in 1948.

WILLS

Sir Walter St. David Jenkins, C.B., C.B.E., a director and former chairman of Elliott Brothers (London), Ltd., who died on 7th June last, left £32,070 gross (£31,688 net).

Mr. R. J. Morgan, managing director and founder of the Tyne & Wear Electrical Co., Ltd., who died on 28th April last, left £15,111 gross (£14,931 net).

Mr. J. Meech, A.M.I.E.E., chairman, joint managing director and founder of Meech Electric Drives, Ltd., and chairman and founder of Burdette & Co., Ltd., who died on 17th March last, left £27,543 gross (£26,976 net).

Mr. G. N. Robbins, late senior London representative for the Edison Swan Electric Co., Ltd., and previously with the International Refrigerator Co., Ltd., who died on 3rd May last, left £12,324 gross (£12,216 net).

Mr. Samuel Hepworth, Batley, Yorks, director and founder member of Hepworth & England, Ltd., electrical engineers and contractors, who died on 1st February last, left £9,711 gross (£9,620 net).

Baird Commemorative Plaque

THE late John Logie Baird first demonstrated his television system at 22, Frith Street, Soho, London, in 1926. To commemorate this event the London County Council has decided to place a plaque on the front of the building and this will be unveiled by Sir Robert Renwick on Wednesday next, 24th October, when a number of Baird's collaborators will be present.

Holme Moss Television Station

THE British Radio Equipment Manufacturers Association is appealing to users of electro-medical equipment in the Holme Moss television area to take advantage of an offer by the G.P.O. to advise them on the prevention of interference with the television picture. Methods of overcoming interference are to screen the apparatus with wire mesh or alter the frequency, both of which can be done without impairing efficiency.

The G.P.O. is asking manufacturers to design all future equipment to operate on frequencies outside the television band. For existing equipment, manufacturers can supply parts for the necessary alterations to be carried out by their own agents or local qualified engineers.

Normally the G.P.O. investigates interference only when it is reported, so that the offer to advise on preventive measures is new. The procedure is to ask the local telephone manager for an engineer to inspect the equipment.

In the description of the Holme Moss television station in our last issue it was stated that S. Dickinson, Ltd., supplied the emergency lighting battery. Messrs. Dickinson inform us that as principal contractors the whole of the electrical wiring installation was entrusted to them. The emergency lighting battery was supplied by the Alton Battery Co., Ltd.

On page 737 the photograph illustrating the combining circuit for the high-power vision and sound transmitters was printed incorrectly, being shown inverted.

Testing House for Lighting Fittings

ON 9th October Mr. D. St. C. Barrie, Warrington District commercial officer, Merseyside & North Wales Electricity Board, was installed as chairman of the Liverpool Centre, Illuminating Engineering Society. In his address he suggested the need for some form of testing house, such as the Good Housekeeping Institute, to give approval certificates for electric lighting fittings and shades. He said that improvements in domestic lighting did not necessarily involve increased lighting loads. Quantity must not be confused with quality. In the past twenty years the cost of one million lumen hours has dropped from £3 10s to 3s or less (using 40 W mellow tubes).

Diesel-Electric Locomotive

ON Monday last the 1 p.m. train from Waterloo to Exeter was hauled for the first time by diesel-electric locomotive No. 10202 previously used only on short trials. The engine, which can attain a speed of 110 miles per hour, is fitted with a 16-cylinder diesel engine developing 1,750 b.h.p. which drives a generator supplying power to the axle mounted motors. The generator and motors were supplied by the English Electric Co., Ltd.

SOME RECENT LIGHTING INSTALLATIONS

(1) Fluorescent lighting at the Bank of Montreal, Waterloo Place, London, S.W.1 (Smart & Brown (Eng.), Ltd.). (2) Motor showroom lighting at Lambs, Woodford Green (Benjamin Electric, Ltd.). (3) Cellulose spraying booths at A. C. Wickman, Coventry (Simplex Electric Co., Ltd.). (4) Mixed fluorescent and tungsten lighting in I.C.I. exhibition room, Welwyn, Herts. (British Thomson-Houston Co., Ltd.). (5) Lighting for nylon stocking manufacture at factory of John Skelton & Co., Ltd. (Metropolitan-Vickers Electrical Co., Ltd.). (6) Floodlighting of Glamorgan County Hall, Cardiff (Philips Electrical)

CORRESPONDENCE

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for the opinions expressed by correspondents.

Alternator Demagnetization

AFTER reading Mr. Easton's letter, I feel sure that he has not obtained a clear idea of the principle of action of the method for rapidly demagnetizing the field of a large three-phase generator. For example, the d.c. motor is normally at rest and only comes into operation when the emergency arises to reduce instantly the voltage of a generator to zero, or approximately zero. In this emergency, the switch *S* would close, thus short-circuiting the field through the rotor of the d.c. machine. As a result, this rotor immediately runs up to a high speed and in this way the electro-magnetic energy of the field becomes transformed into the kinetic energy of the rotor.

The method is not concerned with faults or any other aspect of the power station operation. The device has been in use for many years on the Continent and oscillogram records of its action on the largest types of power station generators have shown that they can be demagnetized in from 10 to 15 seconds.

Jersey, C.I. T. F. WALL.

Peak Load Control

IN his letter of 28th September, Mr. Butterworth gives his opinion that peak load control by means of frequency sensitive relays is impracticable and states his belief that centralized control provides the best solution.

I would refer him to the Clow Report in which the only criticism of the frequency relay is that " its effects cannot be localized to a particular district," but of central control " considerable research will be needed as development in the technique of central control is still taking place."

Of the two it would therefore appear that the former, confined to selected loads in conjunction with time switch control of water heaters, would provide the earliest relief.

Time switches are in full production at the present time, have known reliability and can be adjusted to summer time by a meter reader in a matter of seconds.

The Clow Report, published in July, 1948, states that the water heater component of the national morning peak amounts to 400,000 kW and reference to water heater manufacturers' sales since then indicates a considerable increase in that figure.

Time switch control of water heaters may not eliminate power cuts, but a substantial and early contribution to that end will have been made.

Mr. Butterworth's long term policy may have much to commend it, but as the Clow Report points out " The data at present available are insufficient to enable reasonably accurate estimates to be prepared of the long term gain and costs." Added to this, even partial relief from power cuts in the near future would bring more satisfaction to consumers and the industry as a whole than a rather nebulous long term policy.

New Malden, Surrey. W. A. DEVON.
(Venner Time Switches, Ltd.)

Fuel Conservation

AT the conference on " Meeting the Fuel and Power Shortages," sponsored by the Combustion Engineering Association, at the Dorchester Hotel, London, the British Electricity Authority was condemned outright for being un-co-operative and concerned only with its own development, with a complete disregard for the national interest. More particularly as it affects ourselves, it was concluded that electricity had no place except for the provision of industrial power and domestic lighting. The use of electricity for domestic space and water heating was described as " calamitous." We do not hold a brief for space heating, but on water heating the various speakers demonstrated a bias equal only to their ignorance of the value of the water heating load.

We were very distressed that the B.E.A. had not considered it worth while being represented on the second day of the

conference. As representatives of a small section only of the industry and in spite of our rising indignation we did not consider it proper that we should address the conference even on our own behalf, and we waited until too late, hoping that the Authority would speak for itself and for us. The chairman has since expressed his regret that time did not permit his granting our personal request to make a statement, this request being made only after we had despaired of the B.E.A.

*London, S.W.*1. A. J. WYNDHAM ROBERTS
(Santon, Ltd.)

Parliamentary Candidates

THE Conservative and Labour Parties have provided us with some personal particulars of their candidates in the General Election who are linked in some way with the electrical profession and industry. An asterisk denotes that the candidate was a member of the last Parliament.

Among the Conservative candidates are the following:—Mr. Oliver Lyttelton, D.S.O., M.C.* (Aldershot), chairman of Associated Electrical Industries, Ltd.; Mr. F. J. Erroll, M.A., A.M.I.E.E., A.M.I.Mech.E.* (Altrincham and Sale), well known to our readers for his Parliamentary comments in this journal, and a director of W. J. Furse & Co. and other companies; Sir Arnold Gridley, K.B.E., M.I.E.E.* (Stockport South), prominent in electricity supply and electrical manufacturing affairs and chairman and joint managing director of Mawdsleys, Ltd.; Mr. Charles I. Orr-Ewing, O.B.E., B.A., A.M.I.E.E.* (Hendon North), commercial adviser (technical) to A. C. Cossor, Ltd., and a director of Cossor Radar, Ltd.; the Hon. J. Grimston* (St. Albans), a director of Enfield Rolling Mills, Ltd., and other companies; Mr. P. A. Colvin-Smith, A.M.I.E.E., Assoc.I.Mech.E. (Morpeth), an underwriting member of Lloyds and managing director of a number of companies; Mr. Stuart J. Kerr (Nat. Lib. and Unionist, Dunfermline Burghs), managing director of Cooper-Stewart, Ltd.; Mr. George Peters (Blyth) served an electrical apprenticeship and is now an electrical tester and a member of the A.E.U.; Lt. Comm. L. F. Ramseyer, D.F.C. (Acton), was trained as an electrical engineer and was later with the Northmet Co., and then sales manager of a firm of electrical contractors; Lt. Comm. M. J. Rantzen, R.N.V.R. (Hayes and Harlington) was earlier a student at Ferranti's, a substation engineer in the L.C.C. Tramways, and with the Igranic Electric Co.; Councillor J. Whiteley, Associate I.E.E. (Eccles) is partner in an electrical engineering and contracting firm and a past-chairman of the E.C.A. Manchester and North Western Area Branch; and Mr. H. M. Steward (Liverpool, Edge Hill) is works manager with British Insulated Callender's Cables, Ltd.

The Labour Party's candidates include:—Mr. T. F. Cook* (Dundee East), a member of the Electrical Trades Union and the Society of Instrument Technology; Mr. J. Chuter Ede* (South Shields), a past-president of the British Electrical Development Association and chairman (1934–40) of the former London and Home Counties J.E.A.; Mr. C. R. Hobson* (Keighley), a power station engineer and former member of J.I.C., Electricity Supply Industry; Mr. C. J. Hurley (Heywood and Royton), a member of the E.T.U.; Mr. E. C. Neate, B.Sc.(Eng.), M.I.E.E. (Winchester), a director of Riley & Neate, Ltd.; Mr. A. M. F. Palmer, A.M.I.E.E. (Merton and Morden), editor of the *Electrical Power Engineer* (journal of the E.P.E.A.); the Rt. Hon. R. R. Stokes, M.C.* (Ipswich), late chairman and managing director, Ransomes & Rapier, Ltd.; Mr. W. Vernon* (Dulwich), engineer-electrician; and Mr. P. N. Wilson (Westmorland), managing director, Gilbert Gilkes & Gordon, Ltd.

E.I.B.A. President's Appeal

MR. C. R. KING, president of the Electrical Industries Benevolent Association, has asked us to draw our readers' attention to the growing needs of the E.I.B.A. He mentions that the demands made on the funds and services of the Association increased by some 24 per cent last year but, unfortunately, the income continues to lag behind and, during the same period, it increased by only 12 per cent.

Mr. King says:—"It is a matter for congratulation that those engaged in the electrical industries have had such splendid service provided by far-seeing and practical idealism; but it is no matter for congratulation that so few of them support it in a generous manner. E.I.B.A. has had constantly to struggle to obtain adequate funds, whilst the limited staff had more than enough to do to cope with the problems and difficulties which are intrinsic to its real work.

"May I ask everyone to take stock of what they have done for E.I.B.A. in the past and resolve to do just that little bit more in the future. If those who have helped in past years with regular subscriptions could only make themselves responsible for securing one additional subscriber, then our financial problems in future years would be solved."

The Fuel Position

Minister Addresses London Conference

At a conference arranged by the Combustion Engineering Association on 9th and 10th October, the Minister of Fuel and Power (Mr. P. Noel-Baker) spoke of the serious nature of the fuel situation, both now and in the future. He regarded the term " shortage " as inapt because it implied a temporary limitation, whereas the problem was one of meeting demands for power that were likely to go on increasing more rapidly than fuel could be made available. Two committees had been set up by the Ministry to investigate short and long term aspects.

The difficulty was world-wide. Even in Norway there were power cuts every day last winter. In Great Britain the yearly consumption of coal had risen from 174 million tons in 1932 to 210 million tons as estimated for this year, although less was now used by householders. This increasing consumption ought to go on.

Production and Utilization

The major cause of better productivity in the United States was the use of 3 kW per worker there against 1 kW here. More coal would have to be raised and the tempo of the National Coal Board plans speeded up, accompanied by an increase of manpower in the pits. Among possible further sources of power were underground gasification of thin seams of coal (perhaps five years hence) and methane from the mines for driving gas turbines.

At the same time savings must be made by fuel users. About 82 per cent was at present wasted. Although power costs averaged only from 1½ to 2½ per cent of total production costs in industry, losses should be minimized in the national interest. Thermal efficiencies of B.E.A. stations ranged from 7 to over 28 per cent. When modern plant could carry the whole load the coal saving would be equivalent to 60 million tons annually. Electric fires, which aggravated load shedding, militated against the principle of " consumers' choice " and their sales had had to be restricted.

Sir Hubert Houldsworth (chairman, N.C.B.) said that experiments in mining technique and machinery were promising, but would take some time to develop. Ventilation and storage problems arose out of greater production. In 1938 50 million tons was burned in residences and in 1950 37 million tons. In addition the electricity used required 4 million and 9 million tons respectively, and gas and coke 9 million and 16 million. Allowing for growth of population this meant 1·36 tons per head in 1938 and 1·26 tons in 1950. Stocks had fallen from 10·5 million tons at the end of April, 1949, to 9·2 million in 1950 and would probably be only 7 million in April, 1952.

The Coal Board proposed to mix slurry with dry fuel for burning on chain-grate stokers. He urged a greater use of instruments and the training and up-grading of boiler house operatives. The heat value of refuse at the pits was stated by Dr. R. Lessing to be equivalent to 8 to 10 million tons of good coal per annum; coal with an ash content of 60 per cent could be used with gas turbines.

Generating Plant Capacity

A paper on the supply and effective use of electricity was presented by Mr. C. T. Melling (chairman, Electrical Development Association) who attributed the present shortage of generating plant to precedence necessarily given to armament manufacture during the war. The subsequent installation of 3,000 MW (1,000 MW last year) had not been enough to meet the great increase in demand, especially of industrial consumers. The B.E.A. programme allowed for annual incremental additions up to 1,800 MW per annum in 1952, which was reduced by the Government to 1,500 MW. Only 40 per cent of the country's manufacturing capacity could be allocated to the B.E.A., another 40 per cent being devoted to export. The B.E.A. had, however, arranged with manufacturers to increase their capacity by the erection of new shops, but this would take time.

Three further steps were essential: first,

reduction of delays in planning procedure (nine sites were recently examined for a new power station before one, the least suitable, could be found to meet all objections); secondly, maintenance of the highest priority for materials; thirdly, availability of sufficient capital. Similar considerations applied to distribution.

In the United States, without anything like our plant deficiency, six times the addition to capacity was being made annually. The B.E.A. was retaining obsolete plant and adding small generating units where possible without hindering the main power station programme; large units required less materials and man-power per kW for their construction.

All restrictions on the installation and use of private plants had been removed, except technical conditions regarding switchgear, governors and other features concerning parallel operation. Area Boards proposed, where practicable, to purchase from industrialists their surplus power during peak hours and at other times when fuel economy would thereby be improved. These plants included back-pressure sets.

Power Station Efficiency

The maximum efficiency of power stations had not yet been attained. Two new stations in the United States were estimated to reach 38 per cent, though with higher-grade fuel than could be used in Great Britain. The national fuel policy here required high-grade coal to be reserved for coke ovens, gas works and domestic purposes. All that the B.E.A. required were assured supplies of low-grade coal of consistent quality and a price structure that did not make it more economical to use better qualities.

Regarding the use of electricity, Regional Boards for Industry and towns' electricity committees were co-operating with the Electricity Boards in load spreading in a way that would result in least inconvenience. The Boards would be glad to give information on increasing productivity with the minimum use of electricity.

Peak economy and fuel efficiency did not always go together. For long-hour space heating the use of modern solid-fuel grates helped plant shortage and fuel efficiency, but for short periods of heating they were wasteful; electric heating then saved coal, although adding to the peak demand, in the mornings especially. A major contribution to solving the peak problem had already been made by three Electricity Boards, which had banned the general sale of electric fires.

As a long-term programme more electricity should be used to conserve fuel resources. Thus 1½ million tons of coal per annum could be saved in the textile industry by further electrification. Railway electrification would result in the consumption of 5 million tons of low-grade coal instead of nearly 15 million tons of a high grade. Colliery electrification would save 7 million tons. The adoption of modern electric lighting systems would produce further savings.

The short-term solution of the problem was to close the power gap, the long-term to substitute electricity for cruder uses of coal. Both required the building of new high-efficiency power stations. Through their regular operating characteristics, and with a proper coal price structure, they could burn all the available low-grade fuel. Only with a determined programme of this nature would Great Britain maintain its place as a leader in industry.

In a paper on the supply and use of gas, Mr. J. H. Dyde (president, Institution of Gas Engineers) said that gas turbines might be used to generate 50 to 70 kWh from the waste heat from each ton of coal carbonized. Deducting the kWh used for electrifying the gasworks, the amount available for outside use would be from 25 to 45 kWh per ton. He had not seen a Council house that approached the standard of heat insulation recommended in the Egerton Report. Much of the fuel saved in this way, however, he believed would go towards improving comfort.

He also held that the use of solid fuel for intermittent space and water heating would be wasteful. Gas pressure reduction would not secure economy unless it went to 40 per cent of normal, when there would be danger from instability of by-passes. Differences in altitude would act unfairly as between consumers and instantaneous water heaters would be practically unusable.

The Fundamental Problem

Sir Archibald Forbes (president, Federation of British Industries) referring to a national conference of five years ago on the shortage of fuel and power, said that the position was still the same except that the

power situation was more grave. It not only curtailed production but diverted attention to stop-gap measures and undermined confidence. The fundamental trouble was insufficiency of coal output, which might limit the generation of electricity in the near future. Shortage of fuel might react on the supply of electricity and gas to industry. The railway system, too, might be unable to cope with any exceptional movement of coal (including that imported) during the winter owing to shortage of manpower and of coal suitable for locomotives.

Financial incentives to industrialists to encourage fuel efficiency and the education of operators were both important. With the cost of coal 3 to 3½ times its pre-war level, fuel economy could significantly reduce costs of production.

More harm to industry was likely to be caused next winter by electric peak-load problems than by fuel shortage. Although he realized the convenience and utility of electrical appliances in the home and on commercial premises, these classes of consumers should make the highest practicable contribution by curtailing consumption even at considerable hardship. In industry such measures as power-factor correction equipment should be installed. Private generation should be encouraged in present circumstances. These expedients might require substantial changes in existing tariffs and agreements. Among other points for immediate consideration were the provision of fuel of the right quality for particular purposes and at prices based upon quality and cost.

Discussing short-term economy, Mr. B. E. A. Vigers (Laporte Chemicals) referred to the primary need for managements to be keen on fuel economy and suggested that boiler house operatives should be put on a staff basis after obtaining certificates of proficiency. Trade associations should set up mobile test units for co-operating with those of the Ministry of Fuel and Power.

Regarding the long-term aspect, Mr. Oliver Lyle, who had calculated that the coal shortage in ten years' time would reach 80 million tons, urged the need to take in heat at the highest practicable pressure, to use it over and over again, perhaps five or six times on multiple effect and heat exchange principles, and to throw nothing away prematurely. Only a quarter of the coal might then be needed. In every works requiring more than 10,000 lb/hr of steam he considered that a back-pressure turbine should be installed in the steam system for generating electricity at a thermal efficiency of about 70 per cent. Any additional cost of high boiler pressures was generally justifiable. The balancing of steam and power conditions could be obtained if the plant were run in parallel with the grid.

In reply to a question on the Severn Barrage scheme, Mr. Lyle mentioned the possibility of loss of reservoir capacity with time owing to the formation of silt which, with the possibility of cutting away the river banks and thus causing floods, was causing anxiety at Boulder Dam. There was little knowledge yet of the life of ferro-concrete, but masonry dams were almost everlasting.

Railway Telephone Exchange

THE combined manual and automatic telephone exchange at Manchester Victoria Station, which was installed in 1923, has recently been renewed and modernized at a total cost of £27,000. Apart from requiring excessive maintenance, the old equipment has become inadequate for modern needs.

Owing to lack of alternative accommodation, the new exchange has been installed on the site of the old one. The new equipment includes a 10-position manual switchboard which is associated with a 450-line automatic exchange serving the local railway offices and station. The manual switchboard deals with incoming and outgoing G.P.O. calls (including public inquiries), over 34 direct lines to the Blackfriars G.P.O. exchange, and also with calls to and from the railway telephone system, the connections to which comprise 22 trunks, 36 tie lines and 16 local omnibus lines. Nine lines are provided between the manual switchboard and the station inquiry bureau for incoming public calls, and the whole installation has been designed to allow for future extension.

The equipment was manufactured and installed (with the assistance of British Railways staff) by the General Electric Co., Ltd., under the supervision of Mr. S. Williams, signal and telecommunications engineer of the London Midland Region.

E.C.A. Dinner

The annual dinner of the Electrical Contractors' Association and its allied organizations is to be held at Grosvenor House, London, W., on 29th January.

NEW BOOKS

Festival of Britain 1951: Some Examples of Britain's Contribution to Engineering. Pp. 321; illus. Princes Press, Ltd., 147, Victoria Street, London, S.W.1. Price 63s.

The practice of consulting engineering originally began and has been most fully developed in this country. In view of the Festival of Britain it is fitting, therefore, that the present work, which has been published in collaboration with the Association of Consulting Engineers, should be made available, as it contains comprehensive and fully illustrated descriptions of representative examples of work for which British consulting engineers have been responsible.

Although most of the work is of a civil engineering nature there is a great deal which will interest our readers. The thermal power stations described in detail include Trafford Park, Cliff Quay, Ballylumford and Brunswick Wharf. Another section of the book occupying some 40 pages deals with some of the extensions to British power stations which have been made since 1945. Hydro-electric installations also receive attention and there are full descriptions of the Loch Sloy, Lochaber, Fannich, Tummel Garry and the Ceylon schemes. This book is undoubtedly an excellent record of British engineering achievement.—R.P.

Electronic Applications. By H. A. Miller, A.M.I.E.E. Pp. x+110; figs. 21 and index. E. & F. N. Spon, Ltd., 22, Henrietta Street, London, W.C.2. Price 18s.

In the last year or two there has been a spate of books on electronics, ranging from highly specialized treatises to books of a popular type. It is therefore necessary in considering a new volume to ask if it fills a gap in the literature, the most likely being the lack of information suitable for some special class of reader. In this case the author has been ambitious in that he says the book is intended for ". . . students, engineers, and everyone concerned with and interested in modern scientific and industrial development." The book is, in fact, suitable only for those who have some understanding of electrical theory but no knowledge whatever of the particular electronic devices described. There is no mathematics.

In the very limited space available some attempt is made to describe among other things: thermionic valves of many types, photoelectric cells, cathode-ray tubes, X-ray tubes, counting apparatus, control of many kinds, radar, television and medical uses. After all this there is a chapter on miscellaneous applications! The author has perhaps not done badly to get so much into so small a space, but the book cannot be recommended to anyone requiring more than a most superficial treatment.—V.J.F.

Radio Installations, Their Design and Maintenance. By W. E. Pannett. Pp. 454; figs. and index. Chapman & Hall, Ltd., 37, Essex Street, London, W.C.2. Price 45s.

This book, as its title implies, covers practically every phase of commercial radio from broadcasting station design, transmitters and receivers to line terminations, switching, etc. It is a source of reference of great value to anyone in the industry and should be as much a part of the installer's kit as a test instrument. The book covers a very wide field and the treatment is practical and the terminology correct, while the index is refreshingly arranged to permit quick reference.

The author has given his readers credit for knowing something of the subject with the consequent result of brevity without loss of essentials; the many illustrations and diagrams assist in this connection. It is often true that there are more ways than one of achieving an object. The author has in this case stuck to fundamentals and some of the circuits described, if not always the latest in the art, are a true basis upon which to work.—H.H.W.

Books Received

Modern Magnetism. By L. F. Bates. Third edition. Pp. 506; figs. 134; index. Cambridge University Press, 200, Euston Road, London, N.W.1. Price 30s.

Electroplating and the Engineer. By A. Whittaker. Pp. 87; figs. and index. Emmott & Co., Ltd., 31, King Street West, Manchester, 3. Price 4s.

Synchronous Machines. By C. Concordia. Pp. 224; figs. 23; bibliography and index. Chapman & Hall, Ltd. Price 44s in U.K.

Research at Perivale

Exhibition of the E.R.A.'s Work

THE British Electrical and Allied Industries Research Association has recently held three "open days" (10th to 12th October) at its Perivale Laboratories to give both members and other interested persons an opportunity of familiarizing themselves with the work which has been done there since the inaugural ceremony in 1935, the only other "open day" ever held at the Laboratories.

The exhibition dealt not only with past and present work at Perivale but also with work at other establishments and investigations carried out extra-murally. Work on soft magnetic materials, for example, has been carried out for the E.R.A. at the Cavendish Laboratory and the Universities of Nottingham, Bristol and Sheffield. During the last 15 years many basic problems concerning the better understanding of the behaviour of ferro-magnetic materials have been attacked. To quote a typical example, the magnetic behaviour of single crystals of silicon iron has been investigated and explained in terms of the domain structure of the material. The technique of producing powder patterns, called "Bitter" figures, which portray the domain boundaries at the surface of the metal, was developed to provide experimental evidence of the nature of the domain structure.

Discharges in Gases

At Perivale the work on electrical discharges in gases extends from the study of small break-sparks and the breakdown of minute voids in dielectrics, to the study of astrophysical phenomena, many of which have been found from recent E.R.A. work to be cosmical electrical discharges. In the intervening range, work on arc extinction led to the invention of arc extinguishing devices for circuit breakers, while researches into lightning discharge provided a rational basis for the protection of electricity supply systems.

An interesting characteristic of these investigations has been the elucidation of phenomena occurring on one scale by the study of those observed on quite a different scale. For example, the study of the circuit breaker arc contributed to that of the lightning discharge, and vice versa.

Switchgear was one of the first subjects of research at Perivale. Several new arc rupturing devices have been introduced in the course of this work, two of which have been at the core of nearly all modern switchgear development, namely the air-blast circuit breaker with short fully-scoured arc-gap, and the oil-filled side blast baffle pot. The latter arc control pot, adapted and sold by manufacturers under various trade names, is in use here and abroad up to the highest powers and voltages.

Switchgear Investigations

Broadly speaking, the switchgear department investigates, with the guidance of manufacturers and users, the scientific and technical problems likely to arise in future development. In this process it carries out work of a fundamental as well as of an engineering nature. For example, some modern circuit breakers are specially sensitive to the rate of rise of restriking voltage. A survey of this quantity at all circuit-breaker locations on the B.E.A.'s 66 kV network has been completed and is now being extended to cover higher and lower voltage systems, while the de-ionization of arc gaps under a wide range of system conditions is being investigated at Perivale. Work is also proceeding on the aerodynamics of air flow in contact nozzles of air-blast breakers during arcing.

For investigations into the process of arc extinction the E.R.A. has developed or made available much special instrumentation, including cathode ray oscillography over a wide range of time resolutions up to the highest used in this country. High-speed photographic, stroboscopic and spectroscopic techniques are necessary, as well as measurements and photography of gas flow and of transient currents and voltages, to gain insight into the de-ionizing and other processes occurring during the

all-important few microseconds around current zero. Experiments on a small scale at low powers have thrown much light on the phenomena occurring at much higher powers in both the gas-blast and oil- or hydrogen-producing circuit-breakers. They have also thrown light on some of the causes of the statistical variation observed in repeat tests on a laboratory scale where there appears to be complete control of the physical variables: a problem of great importance in establishing a scientific basis for estimating rupturing capacity.

Apart from switchgear, a wide range of investigations concerning transmission and utilization are undertaken, including problems arising from the co-existence of electricity supply and other networks such as water, gas, and wired and wireless communication. For convenience of administration, the department includes central services of standardization, computation and mathematical consultation for the whole laboratory. Experimental investigations are accommodated in two laboratories, one of which is mainly associated with heavy current and supply frequency problems and the other with lighter current techniques. A considerable amount of field work is also undertaken.

In another department work on surges is directed mainly toward solving the many problems presented by lightning, from the study of the nature of lightning to its effects on equipment and the performance of the devices used to minimize the damage it can cause.

Transformer investigations cover a very wide field and, in addition to surge effects, special attention is being paid to the correct calculation of short circuit stresses, the temperature gradients in a typical transformer and the problem of transformer noise. In the past an important investigation on the latter subject was carried out extra-murally and this work is now being resumed.

Rural Electrification

The work of the rural electrification and wind power department is divided into two separate parts, one covering researches on the application of electricity to agriculture and the other the potentialities and utilization of wind power. There is a link between the two in the investigation of the use of small-scale wind-driven generators to supply isolated farms and premises in districts remote from public supply networks.

Another section of the laboratory is concerned with the electrical equipment of automobiles, with particular reference to ignition systems. Its work includes the development of new types of ignition systems, such as the low voltage surface discharge, and also the measurement and suppression of radio interference from automobile equipment. The problem of contact erosion is receiving attention and work is also being carried out on the intrinsic safety of electrical equipment in hazardous atmospheres, which involves a study of the mechanism of ignition. The E.R.A. high-speed single transient oscillograph, which was designed and developed in this laboratory, is used extensively in this work.

Some of the other subjects of study at Perivale include electrical methods of space and water heating, meter bearings, the electro-physics of the welding arc, insulating materials, and materials in general.

Liverpool Lighting Report

NOT only public lighting but a considerable amount of electrical installation maintenance work comes within the purview of the department of the Liverpool city lighting engineer, Mr. C. C. Smith, A.M.I.E.E. Upon the nationalization of the supply industry the installation section of the department was set up and it was emphasized that as this section grew and took over all the electrical maintenance work formerly carried out by the electricity undertaking additional accommodation would be essential. The question is now becoming a matter of some urgency.

The expansion of the department's installation activities is indicated by the rise in annual income from £13,500 in 1949–50 to £19,000 in 1950–51 and an estimated £22,000 for 1951–52.

The responsibilities of the department also include the maintenance of the electrical and mechanical equipment of the Mersey Tunnel for which experiments are now being conducted in preparation for an entirely new lighting scheme.

With regard to street lighting, the report shows that at the end of March last, 19,365 electric and 9,889 gas lamps were lighted. This total of 29,254 compares with 33,170 before the war, made up of 17,989 electric and 15,181 gas lamps. Electric lamps now in commission include 56 fluorescent, 26 mercury and 3,159 sodium. Of the gas-filled lamps two are of 4,000 W, 18 of 2,400 W and 31 of 1,000 W.

Commerce and Industry

Midlands Ideal Home Exhibition

Further Metal Restrictions

THE best opportunity in the year for people in the Birmingham area to make themselves acquainted with developments in the domestic electrical appliance field is provided by the Midlands Ideal Home Exhibition which closes to-morrow (Saturday) at Bingley Hall. An effective display by the Midlands Electricity Board has as its main themes "Easier and Cleaner Cooking," "Make Short Work of Washday," "Safe Food with Refrigeration," "Hot Water on Tap," and "Service Behind the Radio Set." The advantages of the 13 A plug are emphasized and a special display indicates how an immersion heater should be installed and the lagging applied to the tank.

Other comprehensive displays have been arranged by Walker Bros. (Electrical Engineers), Ltd., and Beehive Warehouse, Ltd. Washing machines are particularly well represented by exhibits of individual manufacturers, including Wilkins & Mitchell, Ltd. ("Servis"), the British Vacuum Cleaner & Engineering Co., Ltd. ("Goblin") and Hoover, Ltd., the last two companies also showing vacuum cleaners. With the Vactric display of cleaners is the "Multipol" combined polisher, food mixer, etc. A clothes dryer and airer is shown for the first time with no-cord ironing units and ozonizers on the J. & H. Walter stand.

A sixpence-in-the-slot meter for hotel use enabling one of two alternative programmes to be selected is demonstrated by Hadley Sound Equipments, while Wilfrid Dunn (Birmingham), Ltd., have on view the "Lexicon" all-electric typewriter. Both Ardente, Ltd., and Fortiphone, Ltd., show hearing aids, the latter's latest products including models with improved tone and hearing range and a high sensitivity bone conduction receiver.

Copper and Zinc Restrictions

The Board of Trade announces a new Order (Copper and Zinc Prohibited Uses (Board of Trade) (Amendment) Order, 1951) extending existing prohibitions of manufacture in copper, zinc, brass and other alloys to some 30 additional domestic articles (none of them electrical). The Order came into operation on 15th October, 1951. The Ministry of Supply will shortly make an Order adding further items to the Ministry of Supply list of prohibitions. Under the amending Order, the use of copper, zinc, etc., in the fabricated or partly processed state will be allowed up to 1st January, 1952, for the articles now prohibited. Also the existing arrangements for licensing for exports, or for articles containing very small amounts of metal, etc., will apply to these additional articles, except that in future no licences will be issued for manufacture of prohibited items for export to other member countries of O.E.E.C.

Visual Aids in Industry

An exhibition showing some of the many applications of visual aid equipment in industry and commerce is being held at the Hotel Metropole, Leeds, from 29th October to 2nd November, by Newton & Co., Ltd. (who are associated with the Metropolitan-Vickers Electrical Co., Ltd.), in conjunction with John Saville & Sons, of York. Among the exhibits will be cameras for industrial and general applications, 16 mm silent and sound cine projectors, and various industrial and scientific instruments designed for specific purposes. Exhibits of particular interest will be the Newton industrial profile projector which magnifies on a screen tiny components such as watch, clock and precision instrument parts, and the Newton "Rotavisor" for animated sales and demonstration aids.

Material Prices Index

The *Board of Trade Journal* shows that the price index for materials used in the electrical machinery industry (100 at 30th June, 1949) was 158·7 in September (provisional figure) against 156·4 in August and 129·0 in September last year.

Purchasing Officers' Association

Criticising the prevalence of the use within industry of the "price ruling" clause whereby contracts were executed purely on the basis of cost, plus a profit ratio, Mr. A. Elliott (a member of the National Council) told the Purchasing Officers' Association Conference recently held in Llandudno that the nationalized corporations and Government departments should provide facilities for industrial consumers to enter into reasonable forward contracts, so that the way was opened to firm price trading, leading to greater all-round efficiency and higher production at less cost. If firm prices were quoted the need for price control orders would in many cases be obviated and black market trading would not be able to thrive. Industry was not free to move away from the protection of the "price ruling" clause until it was enabled to

cover its commitments. Its major costs were fuel, power, transport, steel and imported raw materials; all were under the control of the nationalized corporations and Government departments, which should give a lead in this matter. The Conference decided to call upon the Council of the Association to consider the whole question of the "price ruling" clause and recommend what action should be taken in the matter.

Export Licensing Control

The Board of Trade has issued the Export of Goods (Control) Order, 1951 (Amendment No. 4) Order, 1951, S.I. 1951 No. 1840. Under this Order, which becomes operative on 22nd October, licences will be required for aluminium strip, certain types of air conditioning machines, specified oil well drilling apparatus and tools and oil well logging and exploration apparatus, plant of the kind used for automatic continuous electrolytic tinning of steel strip, certain types of turbines, balloons, electrical machinery, leak detecting instruments, and strain gauging equipment and parts, for all destinations other than those specified in part II of the third schedule, excluding Hongkong.

Inquiries regarding the amendment should be made to the Export Licensing Branch, Board of Trade, Atlantic House, Holborn Viaduct, London, E.C.1 (telephone: City 5733).

Building Steel Allocation

As already announced by the Ministry of Supply, the allocation of steel, which was freed from control in May, 1950, is to be reintroduced. In general, the scheme will be the same as that which was then in force except that alloy steel will be controlled under a separate scheme and cast iron will not be included in the allocation arrangements. It will apply to a number of types of steel. The purchase of manufactured items such as steel windows, cookers and meters will not require an authorization. For sheet steel the present arrangements will continue.

A special arrangement is being made for conduit and steels required for electrical installation work. Members of the Electrical Contractors' Association (or the E.C.A. of Scotland) are being asked by their Association to submit their requirements of steel for use directly on electrical installation work in buildings. Other electrical contractors should submit their requirements of steel for this purpose either to the Association at Africa House, W.C.2 (or in Scotland at 55, Frederick Street, Edinburgh, 2) or to the Directorate General of Building Materials, Ministry of Works, Lambeth Bridge House, London, S.E.1.

Small quantities of steel may be bought in any one month without authorization, on submission of a certificate made out in a form to be specified in the Order to be made by the Ministry of Supply.

E.I.B.A. Ball Tickets

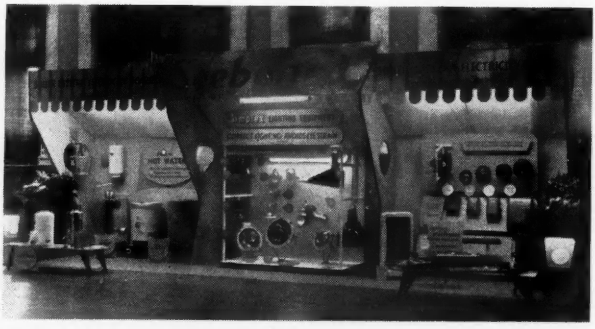
Tickets are still available for the E.I.B.A. Annual Ball on 9th November at Grosvenor House, London, W. Tickets are two and a half guineas each and this year tables are for parties of ten. Tickets may be obtained from the secretary, 32, Old Burlington Street, W.1. (Grosvenor 6508).

Floor Polisher Sales Aid

The Truvox Engineering Co., Ltd., is making available to dealers for short period window displays a rather unusual sales aid for Juno domestic electric floor polishers. This is a full-sized figure known as "Hortense," an extremely futuristic lady in two colour shading with black lettering designed and produced by Austen Johnson Advertising, Ltd.

Electricity in Shops

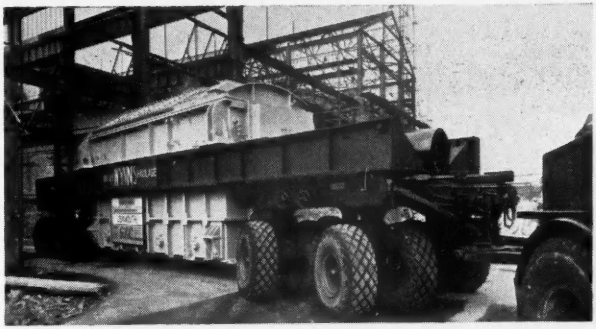
In connection with the recent Shops Acts Administration Annual Conference at Eastbourne, the South Eastern Electricity Board arranged at the Town Hall an exhibition of electrical equipment suitable for use in shops. On the last day of the conference Mr. H. H. Lawrence, A.M.I.E.E., assistant commercial engineer of the East Sussex and South West Kent Sub-Area, reviewed the applications of electricity in shops and outlined the relationships existing between the Electricity Boards and Shops Acts inspectors. Demonstrations were given to show correct and incorrect methods of using electricity for lighting, heating and other shop services.



"Shops Act" display at Eastbourne by the South Eastern Board

Transformer for Uskmouth

The second of six 60,000 kVA generator transformers recently left the Witton Transformer Works of the General Electric Co., Ltd., for the B.E.A.'s Uskmouth power station. The first of the transformers was dispatched a few months ago. It was partly filled with oil which brought its total weight to 131 tons and made rail transport essential. By removing the oil and filling the tank with CO_2, the total weight was reduced to 110 tons enabling the second unit to go by road. A special trailer of 120 tons capacity was used with hydraulic suspension and steering arrangements, permitting it to be manoeuvred in the most awkward places. An adjustable frame can accommodate varying sizes of load.



Generator transformer arriving at the Uskmouth station

Old N'Ions

The annual dinner and reunion of the Old N'Ions Association will be held on 30th November next at the Connaught Rooms, London, W.C.2, at which the guests of honour will be Dr. W. G. Radley, Engineer-in-Chief, G.P.O., and Mr. C. I. Orr-Ewing, technical director of A. C. Cossor, Ltd. Membership of the Association comprises past students of the Northampton Engineering College, Clerkenwell, and any past student can obtain a ticket from Mr. R. W. C. Gilbert, assistant entertainments secretary, 6, Ella Road, London, N.8.

"Wireless World" Diary

The 1952 diary of the *Wireless World* contains eighty pages of reference material, plus the usual diary pages of a week to an opening. In addition to general information and addresses of radio organizations both in the United Kingdom and abroad, the reference section includes base connections for some 670 valves, design data and much other technical information. The diary is published by Iliffe & Sons, Ltd., Dorset House, Stamford Street, S.E.1. (Morocco leather binding 6s 1½d, rexine 4s 3½d, including purchase tax.)

Steel Film Show

On Wednesday last week Mantel Metalworkers, Ltd., entertained a large number of their trade friends at Hill's Restaurant, High Holborn, W.C.1, when a number of films were shown of steel production. The programme included "Pattern for Progress," an admirably produced film of the Ebbw Vale works of Richard Thomas & Baldwins, Ltd., which depicted the complete processes of making steel sheet and tinplate from the basic materials to the finished article. There were also a number of films showing the various stages of construction of the Margam and Abbey works of the Steel Company of Wales, and the programme appropriately concluded with a film issued by the British Iron & Steel Federation, showing the value of scrap in meeting the nation's demand for steel. Mantel Metalworkers had on show some of its products, including "Zedlok" consumers' supply control units for houses and flats.

Nickel and Cobalt Allocations

The International Materials Conference has announced that the governments of the countries represented on the Manganese-Nickel-Cobalt Committee have accepted the Committee's recommendation that plans of distribution of nickel and cobalt for the fourth quarter of 1951 be put into operation at once. All countries were urged to adopt measures to eliminate non-essential uses of these metals and to encourage, where possible, their substitution by metals more readily available. The allocation to the United Kingdom for the period is 5,088 metric tons of nickel and 329·1 tons of cobalt.

Trade Announcements

The works and offices of **Parvalux, Ltd.**, are now at Broom Road, Parkstone, Dorset (telephone : Parkstone 3827).

A third factory has been acquired by **Londex, Ltd.**, in Croydon. The main offices and research section of the company will remain at the Anerley Works, and the Progress (Delivery Inquiries) and Buying Departments at the Penge Works.

Flexible Non-Metallic Conduits, Ltd., of Tottenham Court Road, London, W.1, has been reorganized and its name has been changed to Gilflex Conduits, Ltd. The

works and main stores are now in Hertfordshire and a trade counter is being set up at 41, The Parade, High Street, Watford. The main offices are also being moved to this address.

Sunvic Controls, Ltd., announces that it has made arrangements to manufacture and sell the range of pneumatic process control instruments manufactured by Moore Products Co., Philadelphia, U.S.A.

The Ipswich branch of **Johnson & Phillips, Ltd.,** is being transferred on 22nd October to 17, St. Nicholas Street (telephone : Ipswich 3417 ; telegrams : "Selbac," Ipswich).

Owing to municipal re-numbering of the Chase Estate, the address of **Britannia Electric Lamp Works, Ltd.,** will in future be 17-21, Sunbeam Road, Chase Estate, London, N.W.10.

N. V. Electrical & Musical Instruments, Ltd., have moved into larger premises in Charles Holland Street, Willenhall, Staffs.

Prices of Materials

In the accompanying table we give the prices of the more important materials used in the electrical industry. The figures are those quoted on Monday last.

ALUMINIUM Ingots	ton £124 0s 0d
COPPER, H.C. Electro	ton £227 0s 0d
Fire Refined 99·7 per cent ..	ton £226 0s 0d
Fire Refined 99·2 per cent ..	ton £225 10s 0d
COPPER Tubes	lb 2s 2d
Sheet	ton £277 10s 0d
H.C. wire and strip	ton £254 0s 0d
LEAD, English	ton £176 10s 0d
Foreign	ton £175 0s 0d
MERCURY	flask £73 10s 0d
TIN	ton £1,005 0s 0d
ZINC, G.O.B. Foreign	ton £190 0s 0d
Electrolytic	ton £194 0s 0d
BRASS Tubes	lb 2s 1d
Sheet	lb 2s 4½d
Wire	lb 2s 7¼d
PHOSPHOR BRONZE	
Wire	lb 3s 6¾d
RUBBER, No. 1 R.S.S. spot ..	lb 46d–46½d

Catalogues and Lists

Rheostatic Co., Ltd., Slough, Bucks.—Technical brochure on "Satchwell" modulating valves

London Commercial Electrical Stores, 20-22, Cursitor Street, London, E.C.4.—Three priced folders on "Sol-Tan" infra-red, violet-ray and artificial sun lamps.

Precision Components (Barnet), Ltd., 13, Byng Road, Barnet, Herts.—Folder on "Kabi-Austinlite" ten-way double-pole meter switches and leaflet on moulded bench assembly trays.

Dexion, Ltd., Triumph House, 189, Regent Street, London, W.1.—Illustrated brochure on the applications of "Dexion" patented slotted metal angle.

Brush Electrical Engineering Co., Ltd., Loughborough.—Technical brochure on Brush-Ljungström turbo-generators.

English Electric Co., Ltd., Switchgear Department, Stafford.— Technical folder on the floating armature relay type OJL.

British National Electrics, Ltd., Newarthill, Motherwell, Scotland.—Price catalogue of domestic immersion heaters and circulators.

Bowthorpe Electric Co., Ltd., Crawley, Sussex.—Brochure outlining the company's system of wood pole preservation.

Ekco-Ensign Electric, Ltd., Southend-on-Sea, Essex.—Two illustrated folders, one on industrial and the other on decorative fluorescent lighting fittings.

New "Coolicon" Showcard

The Benjamin Electric, Ltd., has produced an attractive new showcard in connection with its "Coolicon" shades. It measures 19in by 14in and is strutted and mounted on strong board. The colour scheme is blue and black on white.

Electric Service Vehicles

Rediffusion, Ltd., have purchased a number of N.C.B. electric vehicles for maintenance work and loud-speaker delivery. The suitability of electric transport became evident after an investigation carried out by the company had shown that the weekly mileage of some of its petrol vans averaged not more than 226 miles. The 14 cwt model chosen is fitted with a special long-range battery capable of covering regularly 45 miles per charge and a special advantage is the ample carrying capacity of the 135 cu ft body. The first vehicles are being operated in the Newcastle and Liverpool areas.

Information Department

THE extensive records of our Information Department enable us to reply to most queries, but occasionally we ask our readers' assistance in tracing names and addresses not known to us. We should be glad to have such information regarding the makers of the following:—

"Brown" convector heaters.
"Pertite" aerials.
P.v.c. covered twine.
Large electric incinerators suitable for kitchen refuse disposal.
Electrically wound, spring movement, wall clocks.

General inquiries from readers relating to sources of electrical goods, makers' addresses, etc., are replied to by the Information Department through the post. Inquiries should be accompanied by a stamped addressed envelope.

Reactive Power

A More Detailed Consideration

By S. A. SWANN, B.SC.(ENG.), A.M.I.E.E.

THE active power (EI cos ϕ) supplied to a circuit corresponds to the continuous absorption of energy by conductor resistance, as in lamps, radiators, welders, supply mains, etc., and also by motors, whose back e.m.f. has a large component in phase opposition to the current, and which behave therefore, in this respect, in a manner analogous to a resistance. The power input to an a.c. circuit is a fluctuating quantity, and its mean value is the active power. The physical significance of active power is thus clearly evident.

Reactive power (EI sin ϕ) does not correspond to a continuous absorption of energy but is related to the alternating component of the power input. This may be demonstrated as follows. The maximum values of the current and the applied voltage being denoted by I_m, E_m and the angle of lag by ϕ, the instantaneous power input can be written in the form

$$ei = E_m \sin(\omega t + \phi) \cdot I_m \sin \omega t$$
$$= \frac{E_m I_m}{2} [\cos \phi - \cos(2\omega t + \phi)] \quad .. \quad (1)$$

This is the usual expression and represents a double frequency oscillation about a mean value EI cos ϕ, where I and E are r.m.s. values.

The instantaneous power can also be written as

$$ei = EI[\cos \phi - \cos 2\omega t \cos \phi + \sin 2\omega t \sin \phi]$$
$$= EI \cos \phi [1 - \cos 2\omega t] + EI \sin \phi \sin 2\omega t \quad .. \quad .. \quad (2)$$

The first term in (2) fluctuates at double frequency between zero and 2 EI cos ϕ, and its mean value EI cos ϕ is the active power.

The second term oscillates at double frequency, its mean value being zero. Its maximum value EI sin ϕ is equal to the reactive power. The variation of the total instantaneous power and of its two components is illustrated in Fig. 1.

Instead of deriving (2) by multiplying together the instantaneous values of current and voltage the same result can be obtained by considering the separate sources of energy absorption. By this means it is possible to relate the reactive power to the oscillations of the energy stored in the electric and magnetic fields associated with the apparatus supplied, and thus the physical significance of reactive power is rendered more evident.

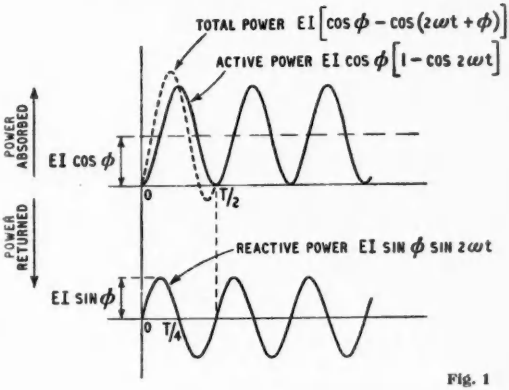


Fig. 1

The energy supplied to a circuit is, (*a*) dissipated in resistance losses, intentional or otherwise, or converted into mechanical power, and (*b*) alternately stored and yielded up again by electric and magnetic fields. The instantaneous rate of dissipation of energy due to (*a*) may be represented by i^2R, where i is the instantaneous value of the current and R is an equivalent resistance determined by the rate of dissipation. Denoting the inductance of the circuit by L, the energy stored in the magnetic field is $\frac{1}{2}Li^2$. Also the energy stored in the electric

field is $\frac{1}{2}Ce^2$, where C denotes the capacitance of the circuit and e is the instantaneous value of the p.d. across the capacitance. The derivations of these results are quite simple and are to be found in most textbooks on this subject. Considering a circuit consisting of R, L and C connected in series and calling the instantaneous power input w we have

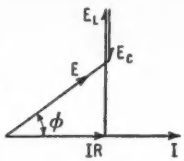


Fig. 2

$$w = \text{rate of dissipation} + \text{rate of storage}$$
$$= i^2R + \frac{d}{dt}\left(\tfrac{1}{2}Li^2\right) + \frac{d}{dt}\left(\tfrac{1}{2}Ce^2\right)$$

The average power input is therefore

$$w_{av} = (i^2)_{av}R + \left(Li\frac{di}{dt}\right)_{av} + \left(Ce\frac{de}{dt}\right)_{av}$$
$$= I^2R + (ie_L)_{av} + (ie_C)_{av},$$

where I is the r.m.s. value of the currents and e_L, e_C are the instantaneous p.d.'s across the inductive and capacitive parts of the circuit. Referring to Fig. 2, if the r.m.s. values of these p.d.'s are denoted as E_L, E_C we have

$$w_{av} = I^2R + \left[\sqrt{2}\,I \sin \omega t \,.\, \sqrt{2}\,E_L \sin\left(\omega t + \frac{\pi}{2}\right)\right]_{av}$$
$$+ \left[\sqrt{2}\,I \sin \omega t \,.\, \sqrt{2}\,E_C \sin\left(\omega t - \frac{\pi}{2}\right)\right]_{av}$$
$$= IR \,.\, I + [IE_L \,.\, \sin 2\,\omega t]_{av} + [IE_C \,.\, -\sin 2\,\omega t]_{av}$$
$$= E \cos \phi \,.\, I + [I(E_L - E_C) \sin 2\,\omega t]_{av}$$
$$= EI \cos \phi + [EI \sin \phi \sin 2\,\omega t]_{av} \quad .. \quad .. \quad (3)$$

This result, which is in agreement with (2), indicates that the total power supplied has an average value EI cos ϕ, corresponding to the continuous power dissipation, and contains a purely alternating component having a maximum value EI sin ϕ, corresponding to the rise and fall of the magnetic and electric fields.

The case where R, L and C are connected in parallel may be examined in a similar manner, and equation (3) is again obtained.

The derivation of this equation indicates that the amplitude of the alternating power component depends upon the voltage difference $E_L - E_C$, and vanishes when $E_L = E_C$, i.e., at resonance. Under this condition no reactive power is supplied and the electric and magnetic fields possess equal amounts of energy, which is transferred from one field to the other. The matter may also be investigated as follows.

From Fig. 1 it is clear that the reactive power is a sinusoidal oscillation having a period T/2, where T denotes the periodic time of the supply voltage. Hence the energy input during one half-cycle of this power oscillation is

$$\frac{2}{\pi} \times EI \sin \phi \times \frac{T}{4}$$
$$= \frac{EI \sin \phi}{2\pi f}$$
$$= \frac{(E_L - E_C)\,I}{\omega}$$
$$= \frac{(X_L - X_C)\,I^2}{\omega} \quad .. \quad .. \quad .. \quad (4)$$

where X_L, X_C denote the inductive and capacitive reactances of the circuit and f is the supply frequency.

The maximum amount of energy stored in the magnetic field is

$$\tfrac{1}{2}LI_m^2 = LI^2 = L\omega\frac{I^2}{\omega} = \frac{X_LI^2}{\omega} \quad .. \quad (5)$$

Similarly, the maximum amount of energy stored in the electric field is

$$\tfrac{1}{2}CE_m^2 = CE_L^2 = C\left(\frac{I}{C\omega}\right)^2 = \frac{X_CI^2}{\omega} \quad .. \quad (6)$$

Hence from (4), (5) and (6) it is evident that the maximum energy input due to the reactive power oscillation is equal to the difference of the maximum amounts of energy stored in the magnetic and electric fields. When these two amounts of energy are equal we have the condition of resonance, since X_L is then equal to X_C, and no reactive power is taken from the supply. A moment's consideration shows that with the series connection of R, L and C the condenser p.d. is one quarter period behind, and with the parallel connection one quarter period ahead of the current through the inductance. It follows therefore that the variation of the energy of the magnetic field is in quadrature with the variation of energy of the electric field. As one field dies down the other builds up, and this accounts for the possibility of interchange of energy.

Oil-Filled Cables

I.E.E. Southern Centre Chairman's Review

HIGH-voltage oil-filled cables were the subject of the inaugural address delivered by Mr. A. R. Ashton Pirelli-General Cable Works, Ltd.) as the new chairman of the Southern Centre of the Institution of Electrical Engineers. He commenced by recalling that it was just 21 years since the first cable of this type was installed in this country. At present there were no less than 96 feeder miles at 132 kV, 260 miles at 66 kV and 200 miles at 33 kV of such cables installed or in process of installation, made by various manufacturers. So far as could be estimated, the total world figure for oil-filled cable at all voltages was about 1,650 feeder miles.

Hydraulic Theory

Mr. Ashton then went on to describe, largely with the aid of diagrams and graphs, how such cables were constructed, with special reference to the associated hydraulic problems and distribution of pressure within the cable. The difference between gravity tank feeding and the two types of pressure tank was made clear in order to explain that the distribution of oil tanks along the cable route was determined solely by transient pressure conditions. It was shown that transient pressures were of small magnitude compared with static (steady state) pressures, and that it was necessary to sub-divide the line with stop joints to limit the maximum hydrostatic head. Theoretically, there was no need for such sub-division, although it was customary, in practice, to provide some segregation to avoid loss of oil in the event of cable damage causing oil leakage.

The first oil-filled 132 kV cable was commissioned late in 1931. The abnormalities then experienced were explained by Mr. Ashton, as well as the ability to specify precisely the kind of oil suitable for any cable under particular conditions. The risk of oil gassing, under electric stress, was thus minimized. Gassing troubles were very much less in evidence at lower stress gradients and so far as the chairman was aware, no troubles of this kind had occurred in 3-core oil-filled cables.

With the aid of lantern slides, various kinds of device were then described which had been designed to indicate oil-leakage and the positions of such leaks, together with indicating switches. A typical circuit for transmitting alarm signals to the control room was shown and it was emphasized that devices of the types described did not constitute protective devices in the usual sense of that term. Their operation did not normally require the cable concerned to be taken out of service, and unless the rate of oil leakage was excessive, the cables could be maintained in commission indefinitely, providing the loss of oil was meanwhile made good.

Opinion had been divided about the necessity for installing alarm devices at all, and there were many miles of oil-filled cable in operation in which reliance was placed on periodical inspection of pressure alone.

Methods of determining the positions of oil leaks were outlined, this operation being most difficult in the case of 3-core cables. One of the reasons for the development of various methods of leak location was the occasional occurrence of defective longitudinal seams in the lead sheaths of some of the earlier cables. Modern seamless lead sheathing had largely eliminated this kind of defect.

Operation After Bomb Damage

During the wartime air-raids on London and other cities a number of direct hits were registered on important cable routes, including those of many oil-filled cables. In the London area alone, between 40 and 50 cases of damage to oil-filled cables occurred. There were instances of cables being severely stretched and of joints being damaged, but in many cases these cables continued to operate for long periods before the damage could be repaired. Some cables were completely severed and quite long lengths drained free of oil. Re-impregnation was carried out while the

cables remained in the ground and they were repaired by replacing very short lengths at the actual sites of damage.

The most important future development would probably be the adoption of higher maximum dielectric stresses, thus permitting the use of thinner dielectric walls which would effect considerable economies in the construction of the cable itself, with some consequential economy in the sizes of oil feeding tanks, because of the smaller oil expansion to be accommodated. Simplification of the outer protective sheaths produced further economies.

The weight of lead in a 1930 type 0·2 sq in 132 kV cable was approximately 12·5 tons/1,000 yd while the present-day equivalent was approximately 4·25 tons. The maximum permissible conductor temperature had also been raised to 85 deg C, and in at least one case 100 deg C had been permitted for occasional short peak-load periods.

Another development was the single-core cable with oil ducts formed in the sheath, known as the "fluted lead" type, used preferably for short tails terminating 3-core cables. Thus the design of trifurcating joints had been considerably simplified.

Also, a 3-core cable had been used with leakage indicator wires enclosed inside, while another was a 3-core S/L type consisting of three single hollow-core cables separately lead sheathed and enclosed in one outer armouring.

The Mollerhoj type was so far the only practical cable with self-contained pressure compensation. The three cores were laid up in flat formation enclosed in a lead sheath with flat sides and special reinforcement. Oil expansion was compensated for by the flexing of the flat sides of the lead sheath. This cable was developed during the war period and had been used at up to 132 kV on the Continent, in some cases, it is believed, for submarine installation.

The most recent development was the introduction of oil of a lower viscosity which had the effect of reducing frictional losses in the oil ducts, thus reducing transient pressures. Such cable had only just been manufactured and laid.

Oil-filled cables for 220 kV had been successfully operating in Paris since 1936. Similar installations in France, either completed or in course of completion, totalled about 8 miles. Some cables for use at 230 kV had been installed in Italy, and cables for 300 kV or more would probably be installed in the very near future.

M.K.S. System of Units

IN his inaugural address as chairman of the East Midland Centre of the Institution of Electrical Engineers, Mr. A. W. Hirst, Head of the Electrical Engineering Department, Leicester College of Technology, dealt with the M.K.S. system of units. He had originally intended the subject of his address to be "Units," with special reference to the M.K.S. system. However, in view of the symposium of papers on this subject presented before the Institution last year he confined himself to a few general remarks on the system, prefacing them by a brief consideration of some of the distinguished men who had been immortalized in the names of the electric and magnetic units. He described the lives and work, illustrated with portraits where possible, of Gilbert, Coulomb, Volta, Oersted, Ampere, Ohm, Joule, Faraday, Henry, Gauss and Weber.

With regard to the position of the M.K.S. system in technical education and its effect on teaching methods, Mr. Hirst felt it was essential that all new text-books should deal adequately with the subject, and all senior students should be taught the relationships between the systems and the meaning of rationalisation. He doubted the wisdom of introducing M.K.S. units at too early a stage because most students would have used c.g.s. units in their preliminary study of physics and would be upset by the sudden change.

Whatever the procedure adopted, said Mr. Hirst, the aim should be to give the student the facility for working in any of the three systems, which he would require not only during what Mr. Hirst thought would be a long transition period, to enable him to read the technical literature of earlier periods.

ELECTRICITY SUPPLY

Gas Turbine Power Station

Northern Ireland Electrification Policy

ONE of Britain's first gas-turbine power stations is now being built in Hampshire by the Ministry of Supply's National Gas Turbine Establishment. This 10,000 kW station, which is expected to be in operation by the end of next year, will be primarily an experimental plant for the study of operating techniques. It will, however, generate power for the Establishment and the waste heat given off by the plant will be used to heat the buildings. The station may also make a contribution to the grid.

The gas-turbine plant operating the station will have two main sections. A low-pressure 2,800 r.p.m. engine will act as a "booster," compressing air for the main high-pressure turbine which, turning at 3,000 r.p.m., will drive the alternator. Both will use kerosene or gas oil as fuel.

Extensions at Portobello

The British Electricity Authority has received the consent of the Minister of Fuel and Power to the extension of Portobello power station by one 60,000 kW turbo-alternator and one boiler with an evaporative capacity of 540,000 lb/hour. The authorization covers the third of six 60,000 kW sets to be installed at Portobello. The first of these is already in commission and the installed capacity of the station is now 165,000 kW.

Bromborough Power Station

The first generating set at the new power station at Bromborough, Cheshire, is expected to be put on commercial load at the beginning of November, and the second one a few weeks later.

Power Prospects

Lord Citrine, chairman of the British Electricity Authority, said at Nottingham last week that the huge programme of new power station construction had not kept pace with the rising demand for electricity. There were three million more consumers than before the war and consumption had more than doubled; it had increased by 30 per cent in the last three years alone. There was no sign of the demand abating. The needs of rearmament were likely to increase rather than diminish the rate of growth: the industry in the last two years had set up new records for the amount of generating plant installed, and this would be still more the case in years ahead. But in face of the abnormal increase in demand it was still not enough. Always supposing that there was no substantial alteration in national policy, or the means at the B.E.A.'s disposal, it would be able to break with physical power cuts by 1956. Lord Citrine said that it was unreasonable to criticize the B.E.A. for shortcomings which were not its own.

Ulster's Freedom from Power Cuts

Speaking in Belfast last week on the occasion of the driving of the first pile at the site of a new power station by the Governor of Northern Ireland, the Prime Minister (Sir Basil Brooke) said it had been an established policy of the Government to attract new industries, especially to the rural areas. As electricity was the only convenient source of power available in many country areas it would have been impossible to establish many of the new firms had they not been able to offer a good supply of electrical power. It had been a tremendous advantage when speaking in Great Britain and abroad of the attractions which Northern Ireland could offer the industrialist to be able to say that they had never yet had to suffer a power cut. Much credit for this was due to the careful maintenance by the engineers responsible for plant which was well past retirement age. Rural electrification schemes were well under way. The Ministry of Agriculture had a scheme in operation for granting loans to farmers for the purchase of electrical plant, and since the beginning of 1950 the Electricity Board had sanctioned the extension of electricity to some 6,800 farms and 8,750 other rural dwellings.

Improved Distribution for Paisley

Better electricity supplies for more than 6,000 Paisley consumers will result from a scheme, costing £415,000 and taking seven years to complete, which the South West Scotland Electricity Board is about to begin in the town. Out-of-date switchgear and cables are to be replaced and the supply voltage is to be increased from 200 to 240. The districts involved include the centre and south side of the town, and vicinities of Brodie Park and Ferguslie Mills. Similar work is proceeding in the burgh

of Ayr, where 727 consumers are still receiving electricity below standard voltages. The Board is also sharing in a £2,000,000 scheme to reinforce the system in the south side of Glasgow.

Rural Supply Economics

The West Lakeland District Committee of the North Western Electricity Consultative Council has asked the Electricity Board to supply electricity to rural areas on less onerous terms. Col. P. M. Hope (Keswick) stated at a meeting of the Committee that the Board's insistence on a 15 per cent return on capital expenditure was wrong. A definite part of the Board's capital resources should be allocated to rural development. It was unfair to allocate the Board's resources to areas which gave the most financial gain. The Committee is to ask the Consultative Council to take the matter up with the Electricity Board.

Peak Economy

On 10th October the London Electricity Peak Economy Committee held its first meeting. The chairman is Mr. J. W. Bowen (chairman of the London County Council).

New Canadian Power Plant

The Lake Buntzen No. 1 hydro-electric plant's new 70,000 h.p. generator due to commence operation this month (October) will replace seven generators which have been in service for nearly half a century. The largest ever installed in western Canada to date, it will almost treble the generating capacity of the plant. The project, which is costing $3,500,000, will raise to approximately 550,000 h.p. the capacity of the B.C. Electric's Lower Mainland hydro-electric generating system.

Premier Angus L. Macdonald recently officially opened the Nova Scotia Power Commission's new $2,500,000 steam generating plant at Trenton.

Street Lighting

A scheme for the relighting of Eastern Avenue, ILFORD, from the borough boundary to the Green Gate, Horns Road, has been submitted to the Ministry of Transport and informal approval has been received by the Borough Council.

BIRKENHEAD Corporation Watch Committee has approved details submitted by the chief constable of the street lighting programme for 1951–52, together with quotations from the Merseyside and North Wales Electricity Board. Subject to the approval of the Finance Committee and the Ministry of Transport, application is to be made to the Minister of Local Government and Planning for sanction to borrow £23,770.

TIPTON Corporation is obtaining a quotation from the Midlands Electricity Board for the installation of street lighting with mercury discharge lamps in Tividale Road.

NORTHAMPTON Corporation is recommended to accept the quotation of the East Midlands Electricity Board amounting to £1,574 for the installation of street lamps on the Sunnyside housing estate.

GUILDFORD Corporation Works Committee recommends the submission to the Ministry of Transport for approval of a scheme prepared by the borough surveyor for the lighting of the by-pass road from Queen Eleanor's Road to the Woking Road with 250 W mercury vapour lamps at an estimated cost of £9,700.

The Ministry of Transport and Ministry of Local Government and Planning have approved the MARCH U.D.C.'s new street lighting scheme and consent has been given to the Council to borrow £4,745.

PETERBOROUGH City Council is to prepare lighting schemes for the Crown Street, Eastfield and Welland Close estates. Mercury vapour lamps are to be installed in Midland Road, Cromwell Road, Vineyard Road, St. John's Street, Westwood Street, Walpole Street and part of Bishop's Road, at a cost of £4,671.

TRADE MARKS

APPLICATIONS have been made for the registration of the following trade marks. Objections may be entered up to 3rd November.

MIXMAID. No. 699,454. Class 7. Electric mixing machines.—Tide Electrical Co., Ltd., 34–36, High Street, Southall, Middlesex.

WINCORD. No. 695,473. Class 9. Insulated clips and devices incorporating an insulated clip, all for holding and guiding flexible conduits attached to hand-operated electric apparatus.—Asmidar, Ltd., 5, Rampayne Street, London, S.W.1.

RAYLECT. No. 697,027. Class 9. Electrical apparatus for operating model electric trains by current control.—Raylecto (Penge), Ltd., 75, Elmers End Road, London, S.E.20.

ARDENTE (design). No. 698,103. Class 9. Sound amplifying apparatus, sound reproduction apparatus and audio-frequency communication apparatus.—R. H. Dent, Ltd., 309, Oxford Street, London, W.1.

RED ROSE. No. 699,199. Class 9. Portable electrical appliances and parts thereof and fittings therefor, all included in Class 9.—G. K. Lancaster (London), Ltd., 50, George Street, Croydon, Surrey.

DIADEM (design). No. 699,598. Class 9. Electrodes for electric welding.—Cooper & Turner, Ltd., Vulcan Works, Vulcan Road, Sheffield, 9.

No. 700,666 (design). Class 9. Thermostats, thermostatic valves, thermostatic switches, thermostatic pilot controls for preventing escape of unburned fuel from fluid fuel burners, and component parts included in Class 9.—Robertshaw-Fulton Controls Co., Greensburg, Pennsylvania, U.S.A. Address for service, c/o Newburn, Ellis & Co., 70–72, Chancery Lane, London, W.C.2.

AEG (design). No. 693,595. Class 10. Electro-medical apparatus and parts thereof and fittings, all included in Class 10.—Allgemeine Elektricitats-Gesellschaft, Berlin-Grunewald, Germany. Address for service, c/o S. E. Matthews, 14–18, Holborn, London, E.C.1.

MOFFAT. No. 678,742. Class 11. Electric cooking stoves and parts and fittings included in Class 11.—Moffats, Ltd., Weston, Ontario, Canada. Address for service, c/o Marks & Clerk, 57 and 58, Lincoln's Inn Fields, London, W.C.2.

LECOMETRIC. No. 697,576. Class 11. Units comprising an electric motor and compressor, for use in refrigerators.—Longford Engineering Co., Ltd., Shripney Works, Bognor Regis, Sussex.

RECENT INTRODUCTIONS

NOTES ON NEW ELECTRICAL AND ALLIED PRODUCTS

Blankets and Pads

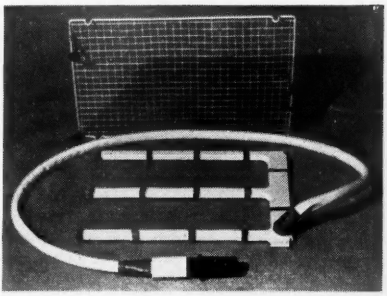
AN electric blanket and an electric pad are now being marketed by EASIPOWER, LTD., 213–5, Gloucester Place, London, N.W.1. Each is provided with a three-heat control switch, multi-thermostat protection, and a washable linen cover. There is no interference with radio. The blanket, which measures 31in by 53in, costs £6 7s 6d (plus £1 11s 10d P.T. in this country). The pad (12in by 14½in) which is attractively boxed, costs 47s 6d (plus 11s 10d P.T.).

Sink Washer Unit

Operated from a vacuum cleaner, the "Bubblewasher" consists of an enamelled trident that rests on the bottom of a standard sink, a detachable mesh to keep the clothes down and an air-hose for connecting to the "blowing end" of the cleaner. It is claimed that an average sink full of mixed washing is thoroughly cleansed within ten minutes without risk of damage by rubbing or chafing, and requires half the normal quantities of soap or washing powders. There are no controls and no maintenance is needed. The running cost is negligible. The apparatus, which is made by the OVERSEAS ENGINEERING CO., LTD., 200, Bishopsgate, London, E.C.2, costs £3 12s (plus 16s P.T. in the United Kingdom).

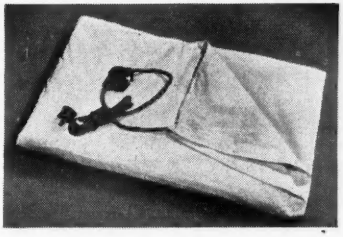
Electronic Moisture Meter

A feature of the "Kappa" electronic moisture meter which is made under licence from J. Lyons & Co., Ltd., by TOPLIS SIMPSON & CO., LTD., Sunleigh Road, Wembley, Middlesex, is that it measures the moisture content of a complete 300 lb bale of jute without the use of probes. This instrument was originally developed for the Indian Jute Association Research Institute. It operates on the change of permittivity with moisture content and is



The "Bubblewasher"

Below: **Easipower thermostatically controlled blanket**



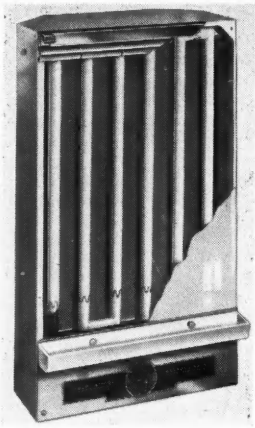
"Kappa" electronic moisture meter in use

accurate to within 0·3 per cent of moisture over its whole working range, which is from 1 or 2 per cent to 60 per cent of moisture, provided that measurements are made under the same conditions as are used for calibration. A frequency of 10 Mc/s is employed in the instrument, which is available for mains or battery operation.

X-Ray Illuminator

The value of first class radiographs is often nullified by indifferent viewing facilities. To overcome this WATSON & SONS (ELECTRO-MEDICAL), LTD., East Lane, Wembley, Middlesex, have designed, in conjunction with the G.E.C., a cold cathode X-ray illuminator.

The 10ft length of tube is internally coated with one of the new halophosphate powders and is formed in the shape of a grid to obtain, in conjunction with a reflector, an unusually high degree of distribution uniformity. The colour approximates closely that of daylight. Three degrees of illumination intensity are provided by a rotary switch with an additional "off" position.



Watson X-ray illuminator with the opal "Perspex" front cut away to show the cold cathode tube

Finished in cream enamel with an opal "Perspex" diffuser the device is rated at about 100 W at 230 V. Both desk and flush mounted wall patterns are available.

Engine Pre-heater

A "limpet" heater designed for pre-heating the engines of commercial vehicles is available from ELTRON (LONDON), LTD., Accrington Works, Strathmore Road, Croydon, Surrey, with ratings of 375, 500, 750 and 1,000 W for circulating water capacities of 20/30, 30/38, 38/48 and 50/80 pints respectively. The device is intended for use wherever it is not convenient or advisable to have a standard heating element projecting into the tank. The overall dimensions of the 1 kW model are 2·5in diameter by 3in projection and for fixing a 1in diameter hole is cut in the tank, the heater being held in place by a single tee bolt. In action, the water circulates automatically through the heater, engine water jacket and radiator, the temperature being maintained at about 100 deg F above that of the surrounding air.

Tramway Diamond Jubilee

ON 29th October, 1891, the first overhead trolley-wire tramway in the British Isles was officially inaugurated at Leeds. It consisted of about 2 miles of double track extending along Roundhay Road and about half a mile of single line from Roundhay Road along Harehills Road to Beckett Street, where the car depot and power station had been built.

The service was started with six single-deck cars built by John Stephenson & Co. of New York, the installation being carried out by the International Thomson-Houston Co., which supplied the tramcars, the overhead line and the power station plant. The track had been laid by the Corporation for steam trams. A report in a local paper at the time refers to the high-speed steam engine belted to two Thomson-Houston "80 h.p. motor-type dynamos." The report gives the information that the tramcars were fitted with two 15 h.p. motors, had accommodation for twenty-two persons, were upholstered and lighted with five incandescent lights.

In connection with this tramway there was an important lawsuit. The National Telephone Company was using an earth return for the telephone lines in Leeds, but when the Tramways did the same for their traction current the effect on the telephones was disastrous. The National Telephone Company therefore sought to obtain a court injunction to prevent the Tramways using an earth return, but the judge ruled that the earth was for anyone to use and that the Tramways had as much right to it as the Telephone Company. The latter therefore put in an insulated return.

In 1896 at Leeds there was an experimental installation of the Anderson surface contact system in which contact studs were raised mechanically as the car passed over them. The system worked successfully for about three years but as with all the surface contact systems, proved inferior to the trolley-wire system. The first dual-gauge tramcars in the world were used in 1907 to connect the two tramway systems of Leeds (4ft 8½in gauge) and Bradford (4ft gauge). Special trucks were used with wheels arranged to slide over fixed axles.

Leeds also pioneered the trolley-bus in this country when a trial installation, carried out in conjunction with one at Bradford, was made in 1911.

FINANCIAL SECTION

Company Notes and Stock Exchange Activities

Reports and Dividends

Ferranti, Ltd.—The annual meeting will be held on 31st October. In his circulated statement, Sir Vincent de Ferranti (chairman and managing director) says that the Canadian company has substantially increased its turnover and its profits. The American company again had an adverse balance, but it has increased its output and has substantial orders in hand.

The output by the parent company of power transformers rose by 27 per cent, and was again a record. Extensions at the new works at Hollinwood are in hand to cope with the increase and the first part of these should be in use by the end of the current year. Work is in hand on two 64 MVA transformers for Finland, and two 275 kV 120 MVA transformers for the British Electricity Authority, while orders have been received for the British Columbia project of the Aluminum Co. of Canada, Ltd., for 301 kV transformers. Other orders included twenty-six 220 kV units for New Zealand and another worth £300,000 from South Africa. In the field of h.v. testing equipment the company is adding a one million volt d.c. generator and a two million volt surge generator to the cable-testing laboratory already constructed for Norway, and have supplied a one million volt a.c. laboratory to A. Reyrolle & Co., Ltd.; five other high-voltage testing laboratories are also in hand. The volume of orders for large synthetic-resin-bonded paper cylinders for transformer insulation is the largest on record. Electricity meter production was 43 per cent higher than last year. Sales of indicating instruments and allied equipment continue to rise and the sales of radio and television sets have also been satisfactory. A lead has been given to the domestic appliance industry by the launching of the "Safera" electric fire. Civil aviation beacons are being installed in London, Rome and Cairo, and airborne equipment is being fitted to the first few Comet aircraft.

The company, with the Ministry of Supply and the Scottish Council (Development and Industry), is participating in a scheme to further research and development facilities in the electronics and instrument fields in Scotland.

As a condition for the granting of a Stock Exchange quotation and permission to deal in the company's 5 per cent second redeemable cumulative preference stock the articles of association are to be amended to alter the special rights and privileges attached to the different classes of stock. Meetings for this purpose are to be held after the annual meeting.

James Howden & Co., Ltd., held their annual meeting on 12th October, Mr. C. W. Hume (chairman) presiding. In his circulated statement the chairman said that the company had orders representing several years' work, but with the growing shortage of steel it was difficult to see far ahead, and if supplies continued to be as restricted as they had been in recent months they would necessarily have an adverse effect on future output. The demand for their products for land power stations continued unabated, not only at home but abroad, and the main business had recently touched new high levels.

The Phœnix Telephone & Electric Holdings, Ltd.—The annual meeting was held on 12th October, Mr. G. F. Shipman (chairman) presiding. In his circulated statement the chairman said that the output to date for the current financial year, showed an increase as compared with the corresponding period of last year, and the volume of orders in hand was sufficient to absorb the group's productive capacity for many months ahead.

The Kalgoorlie Electric Power & Lighting Corporation, Ltd.—Speaking at the annual meeting held on 10th October, Mr. W. F. Talbot (chairman) said that since his statement had been circulated their application to the Western Australian Electricity Commission to increase power charges had been granted to the extent that they could now charge an extra 0.125d per kWh for power sold to bulk consumers, with retrospective effect to 1st June last.

Strand Electric Holdings, Ltd., reports a consolidated gross trading profit, for the year to 30th April last of £273,894, as compared with £235,833 for the preceding year, and a net profit of £56,846 (against £52,760). As already announced, the dividend for the year is unchanged at 17½ per cent.

Holophane, Ltd., reports a net profit for the year to 30th June last of £88,424, and after deducting £51,250 for taxation and writing off £213 from patents account, the balance is £36,961 (against £43,457). General reserve receives £20,000 and a further £20,000 is applied in writing off goodwill and patent

rights. The dividend for the year is maintained at 15 per cent by a final payment of 7½ per cent and £24,528 is carried forward (against £36,442).

It is proposed to capitalize £50,000 of the general reserve and to make a bonus issue to ordinary stockholders of one 5s unit for every two 5s stock units held.

The Radio & Television Trust, Ltd., reports a consolidated loss for the year to 31st March last of £49,787 (against a loss of £27,010), after crediting tax recoverable of £1,905. After allowing for sundry credits, the adverse group balance carried forward is reduced by £1,072 to £821,659.

The Electrolytic Zinc Co. of Australasia has announced a final ordinary dividend of 10 per cent, plus a bonus of 15 per cent, making a total distribution for the year to 30th June last of 35 per cent. For the previous year the distribution was 25 per cent, comprising a dividend of 15 per cent and a bonus of 10 per cent.

Babcock & Wilcox, Ltd., have declared an interim ordinary dividend of 7½ per cent (against 5 per cent). It is stated that the increase is solely in order to relate the interim dividend more closely to the final distribution.

The British Aluminium Co., Ltd., is paying an interim dividend of 4 per cent on the £5,000,000 ordinary capital. This is at the same rate as for the previous year, but the £2,000,000 ordinary stock issued last November now ranks for the interim payment.

The Brush Electrical Engineering Co., Ltd., proposes to pay an interim dividend of 4 per cent (same). In June last a final dividend of 6 per cent, making 10 per cent for 1950, was paid on £2,400,000 ordinary capital as increased in July, 1950, by £800,000.

The Calcutta Electric Supply Corporation, Ltd., has declared an interim dividend of 3 per cent, tax free (unchanged).

New Companies

Electrical & Radio Engineers (Hendon), Ltd.—Registered 28th September. Capital £1,000. Directors : T. S. Rey and Dora Rey. Regd. office : 262, Watford Way, Hendon, N.W.4.

Gerald's (Radio & Electrical), Ltd.—Registered in Edinburgh 26th September. Capital £10,000. Manufacturers, importers and exporters of all kinds of electrical and other instruments, etc. Directors : G. A. Joseph and N. Samuel. Regd. office : 1407, Gallowgate, Glasgow.

Ridgeway Hinds & Co., Ltd.—Registered 3rd October. Capital £1,000. To acquire the business of an electrical and mechanical engineer heretofor carried on by G. A. Ridgeway Hinds at 29, Upper Thames Street, E.C.4. Directors : G. A. Ridgeway Hinds and Mrs. Emmeline E. Hinds. Regd. office : 223, Upper Thames Street, E.C.4.

Oswald Hughes (Electricals), Ltd.—Registered 5th October. Capital £2,000. To acquire the business of an electrical contractor carried on by O. Hughes. Directors : O. Hughes and T. W. H. Mills. Regd. office : 15, Queen Street, Newcastle-on-Tyne.

Modern Teleservice, Ltd.—Registered 4th October. Capital £1,000. Radio and television engineers, sound, acoustic and electrical engineers, etc. Directors : D. A. Stephen and Jean A. Stephen. Regd. office : 17, London Road, Alderley Edge, Ches.

Electrical and Allied Distributors (N.I.), Ltd.—Registered in Belfast 1st October. Capital £1,000. Electrical, radio, television, mechanical, civil and general engineers, etc. Regd. office : 31, Bruce Street, Belfast.

Increases of Capital

Lancashire Dynamo Holdings, Ltd.—Increased by £650,000, in £1 ordinary shares, beyond the registered capital of £660,000.

Bolton Electrical Traders, Ltd.—Increased by £8,500, in £1 ordinary shares, beyond the registered capital of £1,500.

Nigerian Electricity Supply Corporation, Ltd.—Increased by £55,000, in £1 ordinary shares, beyond the registered capital of £545,000.

Liquidations

Tok Switches, Ltd.—(Members' voluntary winding up). Meeting 20th November at 11, Ironmonger Lane, London, E.C.2, to receive an account of the winding up by the liquidator, Mr. F. W. Charles.

S. I. M. Electrical Co., Ltd.—Winding up voluntarily. Liquidator, Mr. O. A. Watson, 10, Peacock Lane, Leicester. Particulars of claims to the liquidator by 17th November.

Bankruptcies

C. F. Adams and **F. Harris,** lately carrying on business at 351, Forest Road, Walthamstow, Essex, under the style of Swift Bros., electrical engineers.—Last day for receiving proofs for dividend 26th October. Trustee, Mr. W. F. Cresswell, Bankruptcy Buildings, Carey Street, London, W.C.2.

C. Welbourn, now residing at 227, Hykeham Road, Lincoln, electrical engineer, formerly carrying on business at 158, Hykeham Road, Lincoln, as an electrical engineer and contractor.—Receiving order dated 25th August, 1950, rescinded, order of adjudication dated 28th September, 1950, annulled and petition dated 11th August, 1950, dismissed, debts having been paid in full.

STOCKS and SHARES

IN accordance with long tradition, the Stock Exchange markets on the eve of General Election are proceeding with caution and there is a noticeable falling away of business. Holders of stocks and shares on the one hand, and prospective purchasers on the other, are both pursuing a policy of restraint. That the result of the election is pretty certain to have a considerable effect upon prices of Stock Exchange securities is generally agreed, which, in other words, means that it must be right either to buy, or else to sell, at the present juncture. Which course to adopt, however, is in too much doubt for it to be generally pursued, the consequence being that, as already mentioned, business is quiet while prices keep firm.

Brush Plans

Declaration of another 4 per cent interim dividend by Brush Electrical recalls the fact that the political events this month are likely to have a particularly important bearing on the company's plans. For one thing, the proposal to reconstitute the company under the new name of Brush Aboe was shelved on account of the obscurities introduced by the dividend control possibility: the plan is to turn the company into a holding concern with assets consisting almost entirely of investments in manufacturing and selling companies, and to form a new concern, Brush Electrical Engineering, to take over the Loughborough works. More recently, Mr. Alan Good, the managing director, has said that discussions were taking place with a view to raising new capital. It is the market's view that news in that connection would remove a factor which has been a subduing influence on the shares since the merger of 1949. They are quoted at 6s 9d, a gain of a few pence on the week.

Ferranti Accounts

The dimensions of Ferranti, Ltd.'s business, as shown in the full report issued last week, have renewed comment on the fact that public interest (from the investment point of view) remains confined to the two classes of preference capital: the 5 per cent shares are quoted at 20s 9d and the 7 per cents at 28s 3d. Expansion is apparent everywhere in the accounts. Not only was the group trading profit for 1950–51 doubled, at close on £1½ million (before tax), but the company has a record order book of over £12½ million, and plans further extension of the factories in order to cope with it. In the balance sheet, stocks are shown to have risen by £700,000 and bank loans by nearly half a million to £1·6 million. The privately-held £500,000 ordinary stock again receives a modest 6 per cent tax-free dividend.

Week's Price Changes

Associated Electrical Industries, 92s 6d, have risen ¼, and there are gains of 1s or 1s 3d in British Insulated Callender's, 37s 6d, Lancashire Dynamo, 57s 6d, Marconi Marine, 36s 3d, General Electric, 96s 6d, De la Rue, 37s, and Murex, 58s. Cable & Wireless ordinary put on 2½ points to 122½. Ward & Goldstone, 45s, are a florin to the good. Ericsson Telephones further advanced to 54s, and Metal Industries to 44s 3d. Allen West recovered to 12s 3d. Oriental Telephones eased off to 53s 6d. Cossor, 17s, and Decca Record, 20s, are 6d lower on the week.

Britannia Electric Results

There is a relatively restricted market in the 5s ordinary shares of Britannia Electric Lamp Works, and the fact that little of the £175,000 ordinary stock is at present on offer can be understood in the light of the preliminary profits statement, issued a week ago, for the year ended last March. Group profits are returned this time at over £50,000 (after tax of £61,000) against the previous figure of £29,000 (after tax of £34,000). The dividend is being maintained at 12½ per cent for the fifth year running. This involves the distribution of less than a quarter of the surplus, and presumably means a useful reinforcement of the balance sheet position, which was notably strong in quick assets a year ago. The price of the shares is about 11s.

E.P.T.?

Nobody concerned seriously with investments is expecting anything like plain sailing, whichever way the election may go. A change of Government could not quickly deal with the anxieties of the economic situation, and one of the things arising immediately from it would presumably be the excess profits tax which figures in the Conservative manifesto. Speculation on the subject is, of course, doubly unprofitable until, first, the occasion and, secondly, its form, materialize, for the statement goes into no detail about its proposed scope or application. Industrial shareholders can scarcely be expected to welcome the idea; in some more disinterested quarters, taxation on those lines is criticized as a "disincentive." There is mention in the manifesto too, however, of an examination of the field of company taxation, and it is hoped that this may raise the question of, among other things, depreciation allowances, of which the present inadequacy is a recurrent theme of chairmen's speeches. It seems safe, in any case, to say that most shareholders would swallow without complaint a reasonable dose of E.P.T. in preference to some of the alternatives.

NEXT WEEK'S EVENTS

Monday, 22nd October

BIRMINGHAM.—James Watt Memorial Institute, Great Charles Street, 6 p.m. I.E.E. South Midland Radio Group. Address by Dr. D. C. Espley, chairman of the Radio Section.

BRISTOL.—Electricity House, Colston Avenue, 6 p.m. I.E.E. Western Utilization Group. Address by A. H. Young, chairman of the Utilization Section.

CHESTER.—Town Hall, 6.30 p.m. I.E.E. Mersey and North Wales Centre. "Electrical Control of Dangerous Machinery and Processes: Part II—Electrically Interlocked Guards on Machines," by W. Fordham Cooper.

LONDON.—Savoy Place, W.C.2, 5.30 p.m. Institution of Electrical Engineers. Informal meeting. Discussion on "The Place of Electricity in a National Fuel Policy," opened by Sir John Hacking (president).

NEWCASTLE-ON-TYNE.—Neville Hall, Westgate Road, 6.15 p.m. I.E.E. North-Eastern Centre. "The Performance of the British Grid System in Thunderstorms," by Dr. J. S. Forrest.

SHEFFIELD.—The University, Western Bank, 6.30 p.m. I.E.S. Sheffield Centre. "Radiation, Lighting and Illumination," by J. N. Aldington.

Tuesday, 23rd October

GLASGOW.—At the Institution of Engineers and Shipbuilders, 39, Elmbank Crescent, 7 p.m. I.E.E. Scottish Centre. "The Protection of Electrical Power Systems—A Critical Review of Present-Day Practice and Recent Progress," by H. Leyburn and C. H. W. Lackey.

LEEDS.—Lighting Service Bureau, 24, Aire Street, 6 p.m. I.E.E. North Midland Centre Education Discussion Circle. Discussion on "Visual Aids—Help or Hindrance?" opened by D. Polak.

LONDON.—Savoy Place, W.C.2, 5.30 p.m. I.E.E. Measurements Section. Chairman's Address, by F. J. Lane.

MALVERN.—Winter Garden Restaurant, 7.15 p.m. I.E.E. South Midland Centre. "The Determination of Time and Frequency," by H. M. Smith.

MANCHESTER.—Engineers' Club, Albert Square, 6.15 p.m. I.E.E. North-Western Supply Group. "Transient Theory of Synchronous Generators Connected to Power Systems," by B. Adkins.

NOTTINGHAM.—Gas Showrooms, 6.30 p.m. I.E.E. East Midland Centre. "The Planning of an Electricity Board's Distribution System," by G. O. McLean.

RUGBY.—College of Technology and Arts, 6.30 p.m. I.E.E. Rugby Sub-Centre Students' Section. "The Recording and Reproduction of Sound using Magnetic Tape," by P. D. Gibbons.

Tuesday, 23rd October, to Friday, 26th October

LONDON.—Olympia. Dairy Show.

Wednesday, 24th October

KENDAL.—Allen Technical Institute, 7 p.m. I.E.E. North Lancashire Sub-Centre. District meeting. "The Planning of an Electricity Board's Distribution System," by G. O. McLean.

LONDON.—Waterloo Bridge House, S.E.1, 5 p.m. Institution of Post Office Electrical Engineers. Informal meeting. Vice-chairman's Address. "Miscellaneous Services," by J. Stratton.

Management House, 8, Hill Street, Berkeley Square, W.1, 7 p.m. Institute of Industrial Administration. London Centre. "Management in Practice, No. 2, Attitudes," by S. Waugh.

MANCHESTER.—Engineers' Club, Albert Square, 6.30 p.m. I.E.E. North-Western Radio Group. Chairman's Address, by Professor F. C. Williams.

MIDDLESBROUGH.—Cleveland Scientific and Technical Institute, 6.30 p.m. I.E.E. North-Eastern Students' Section. Chairman's Address. "The Development of Power Cables," by G. P. Cundall.

WEYMOUTH.—Dorset Technical College, 6.30 p.m. I.E.E. Southern Centre. "The Sutton Coldfield Television Broadcasting Station," by P. A. T. Bevan and H. Page.

Wednesday, 24th October, to Friday, 26th October

LONDON.—39, Victoria Street, S.W.1. Junior Institution of Engineers. Historical exhibition.

Thursday, 25th October

FALKIRK.—Temperance Hotel, Lint Riggs, 7.15 p.m. I.E.E. Scottish Centre. District meeting. "Lightning," by Professor F. M. Bruce.

LONDON.—Savoy Place, W.C.2, 5.30 p.m. I.E.E. Utilization Section. Chairman's Address, by A. H. Young.

Study of Natural Lighting

IN his inaugural address as president of the Illuminating Engineering Society Mr. J. G. Holmes (Holophane, Ltd.) dealt with the need to study natural lighting. He said that most of our seeing was done by daylight, our eyes were evolved for use in daylight and we liked daylight.

The requirements for daylighting and artificial lighting were sometimes thought to be different and this was true of some rooms which served different purposes by day and night. Most rooms, however, were used for specific tasks, as in offices and factories, and there was no reason why the provision for artificial lighting should be different in its effects from that for natural lighting. In fact, most installations were used to supplement daylight in the morning or evening. The introduction of fluorescent lamps which blended well with daylight had led to rapid progress in the combination of natural and artificial lighting. In some cases, such as Room 21 in the National Gallery, the ordinary observer could not detect any difference.

The matter of light distribution, however, was quite different. Neither the daylighting expert nor the installation designer knew exactly what was wanted, although the latter was probably able to get nearer the best result. Now both of them had a common problem.

Apart from a few individual workers there did not, at present, seem to be much activity in this country on daylighting research although other countries were showing greater interest.

Engineering in Europe

Survey of Current Literature

THE ageing condition of h.v. insulation depends on the temperature of the hot spot which can only rarely be located with accuracy; it is obviously also determined by the quality of the insulating materials used and the accuracy of production, operating conditions of the machine, ambient moisture, etc. At 150 deg C the expectation of life of a winding with Class A insulation is 1,000 hr, at 149 deg C it is 13 per cent = 130 hr more, etc.

A. Boyajan has suggested three age indicating devices for electrical apparatus based on variable integrating recording of the service hours, two of which are rather complicated mechanisms which at rated loads, and therefore temperatures, run at a low rated speed and at higher temperatures at speeds proportional to a power of the temperature. The third variant is based on the VAr-meter principle combined with a reactor with a strongly temperature-sensitive iron alloy core. This core is heated by the load current, its material having a permeability decreasing from 2,800 at 23 deg C to 1 at 170 deg C (non-magnetic condition). This process corresponds very well indeed to the decrease in life-expectation of Class A insulating materials. This, however, does not mean that the actual design of the reactor for temperatures above 150 deg C is simple.

These three solutions, then, are more theoretically interesting than successful solutions of the practical problem. The author describes his own solution which consists in measuring the temperature of a Ni resistance heated in a thermal " image " of the winding. The other arms of the measuring bridge circuit consist of temperature-insensitive resistances. The potentiometer is divided into steps (say, 50) according to the ageing rates corresponding to individual temperatures. It is of the rotary switch type, it may be driven by a constant-speed motor controlled by time relay so as to obtain a point on a recording tape every hour or so, and thus a continuous record at one-hour intervals, which is quite sufficient for the purpose. The instrument is thus of the sweep-balance type.—" Indication of Ageing of the Insulation of H.V. Windings," G. Keinath, *Archiv für Technisches Messen*, No. 188, T98–99, September, 1951, in German.

Fault Location

The difficulties of fault location in modern power and communications systems with their complicated and multiple interconnections are well-known, and the many types of possible faults complicate the task still further. The conventional methods, bridge and loop measurements of capacitance, inductance or impedance are slow and laborious. It was known for some time that the principle of electrical echo-sounding (similar, to a certain extent, to radar), could be applied to this problem. It consists in injecting a periodic sequence of pulses of suitable shape and sufficient energy into the line (whether cable or overhead conductor) which would be reflected on an existing fault. The time of the direct and return travel of the pulse is measured and the distance can easily be determined from the known propagation velocity of the pulse along the cable and the characteristic impedance of the cable or line.

If a pulse travels along a line open at its end, it is reflected there with a positive reflection coefficient $+1$; thus there is phase equality between emitted and reflected pulse. At a short-circuited line end it is -1; thus there is phase opposition between emitted and return signal. If the cable terminates in its characteristic impedance, $p = 0$, no reflection takes place. Thus the phase relation between emitted and return signal (" echo " pulse) permits inferences to be drawn on the nature of the fault and of locating it if the propagation velocity is known.

A fault location equipment of German make described in the article uses a not too complicated electronic apparatus with a cathode ray tube for pulse representation and time measurement. It locates faults with an accuracy of $\pm$ 0·2 per cent and has the advantages of being insensitive to

interferences, being capable of locating interruptions of the cable cover just as those of the conductor and of enabling live cables to be examined.—" Modern Methods of Fault Location in Power Systems," N. N. Röschlau, *Electro-techniek*, Vol. 29, pp. 288–290, No. 15, 19th July, 1951, in German.

Insulating Oil

Given the general suitability of a type of oil for insulating purposes, there are two main aspects of the problem of actually obtaining and maintaining the characteristics found in a specimen of the oil in the large quantities required in practice. The first is the physical, or mechanical, purity of the oil which must not be taken for granted, considering that drums, etc., used for the oil transport are never ideally clean. The second is the chemical condition, which determines the ageing characteristics, just as the first is largely responsible for the dielectric properties of the oil. The physical purity is obtained by preparation of the oil in separators, filter presses and by vacuum drying before use, whereas the chemical composition may be controlled by removal of the products of ageing, sludge, etc., topping up with suitable fresh oils and, lastly, by " regeneration."

Success depends on careful and periodically repeated tests, apart from the maintenance of permissible temperature in operation and prevention of the access of air as far as possible. A temperature rise of 10 deg approximately doubles the rate of ageing. When fresh oils are mixed, as is often necessary, the characteristics of the more valuable component, even though it may represent the smaller fraction, often determine the characteristics of the mixture, although this need not always be so. This article deals with the criteria applying to the choice of suitable oils, testing methods and production of typical insulating oils, showing the effects of production errors (over and under-refining) on the dielectric and ageing characteristics, effect of inhibitors, etc.—" Characteristics and Maintenance of Insulating Oils," F. Skala, *Osterreichische Zeitschrift für Elektrizitatswirtschaft* (*O.Z.E.*), Vol. 4, No. 6, pp. 206–218, June, 1951, in German.

Readers may arrange, by request, to obtain accurate full translations of any of the articles abstracted in this section, at the usual rates.—Editors, *Electrical Review*.

DUTCH IMPORTS

Increased Electrical Trade in 1950

HOLLAND'S electrical import trade last year made a forward movement in all the more important lines (except transformers), many of the increases being substantial. Values of a selection of the leading groups and of their chief suppliers in 1950 are shown in the accompanying table with notes of increases or decreases on 1949. While Belgium-Luxemburg was a leading supplier, Germany made striking progress, notably in the wire and cable trade; Great Britain's participation in Dutch electrical import trade otherwise was fairly well maintained.

In addition to the items shown in the table, power plant (unspecified) was imported to an increased value of about 40 per cent on 1949,

Class of Goods	1950 Gld. (000)	Inc. or dec. on 1949 Gld. (000)
Motors 10 kg or less	1,651	+ 445
From Great Britain	773	+ 287
„ *West Germany*	296	+ 183
Motors over 10 kg	15,426	+ 1,107
From Great Britain	4,688	− 331
„ *Belgium-Luxemburg*	3,655	+ 592
„ *West Germany*	3,117	+ 2,356
Transformers 10 kg or less	1,673	+ 726
From Belgium-Luxemburg	1,210	+ 534
„ *Great Britain*	141	+ 9
„ *United States*	140	+ 136
Transformers over 10 kg	6,166	− 1,207
From France	2,199	+ 207
„ *Great Britain*	1,429	− 1,499
„ *Belgium-Luxemburg*	989	− 535
Static convertors over 10 kg	2,872	+ 401
From Great Britain	1,210	+ 578
„ *Belgium-Luxemburg*	424	− 116
Accumulators	4,979	+ 1,151
From Belgium-Luxemburg	1,348	+ 680
„ *West Germany*	1,144	+ 903
Vacuum cleaners	2,559	+ 1,593
From Great Britain	1,285	+ 1,098
„ *Sweden*	696	− 21
Electro-medical apparatus, other than tubes	3,485	+ 1,370
From Great Britain	709	+ 469
„ *West Germany*	686	+ 277
„ *Switzerland*	792	+ 380
Radio valves	5,931	+ 876
From Belgium-Luxemburg	2,217	− 847
„ *Great Britain*	1,245	+ 536
Radio apparatus	28,237	+ 9,291
From Belgium-Luxemburg	23,033	+ 6,229
Telephone apparatus	16,746	+ 3,663
From Belgium-Luxemburg	8,034	+ 2,190
„ *Sweden*	2,420	+ 501
„ *Great Britain*	2,022	+ 258
Insulated cables and wires	14,257	+ 218
From Belgium-Luxemburg	3,009	− 886
„ *West Germany*	6,560	+ 5,055
„ *Great Britain*	2,038	− 98
„ *Italy*	1,040	− 2,732

indicating and measuring instruments (including meters) nearly 50 per cent, and regulating and distributing apparatus also to a larger extent. In these three groups Switzerland was well represented. (The value of the Dutch guilder is about 2s.)

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (2s each) will be obtainable after 28th November from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1946

23657. Nyrop, J. E.—Method of treating products by oscillating high-frequency electrical currents producing alterations of the products. 9th August, 1946. (661c51.)

1947

10574. Igranic Electric Co., Ltd.—Flexible rubber-like jackets for liquid cooling of glass tubes. 21st April, 1947. (661853.)

23310. Western Electric Co., Inc.—Micro-wave testing systems particularly for short pulse transmitters. 22nd August, 1947. (661857.)

27216. Taylor, A. M.—Arrangements for long-distance polyphase electric power transmission systems. 14th July, 1948. (661859.)

34973. Staatsbedrijf der Posterijen Telegrafie en Telefonie.—Coupling circuit arrangement for coupling a two-wire direct-current telegraph line to a two-channel trunk. 31st December, 1947. (661866.) 34976. Termination for coupling two-wire to four-wire telegraph lines. 31st December, 1947. (661867.)

35322. Electro-Watt Electrical & Industrial Management Co., Ltd.—Photo-electric device for indicating the diminution of light. 31st December, 1947. (661654.)

1948

6287. Sprague Electric Co.—Electrical conductors. 28th February, 1948. (Cognate application 6288, 18th May, 1945.) (661870.)

8240. Sperry Corporation.—Timing systems incorporating electrical synchronizing systems. 19th March, 1948. (661954.)

9984. Sorensen, H. S.—Voltage regulator. 9th April, 1948. (661872.)

11181. Standard Telephones & Cables, Ltd.—Telecommunication switching systems and exchanges. 23rd April, 1948. (661955.)

13794. Standard Telephones & Cables, Ltd. (Materiel Telephonique Soc. Anon.)—Velocity-modulated electron-discharge tubes. 21st May, 1948. (661657.)

23840. Standard Telephones & Cables, Ltd.—Switching system for establishing a number of connections by means of one or more multiple switches, for example, for use in an automatic telephone exchange or the like. 10th September, 1948. (661884.)

24409. Standard Telephones & Cables, Ltd.—Velocity modulation wide band amplifier tubes. 17th September 1948. (661665.)

25917. Ford Motor Co., Ltd.—Automatic arc welding. 5th October, 1948. (661671.)

26417. Standard Telephones & Cables, Ltd., and Cragg, W. D.—Mounting for loudspeakers. 7th October, 1949. (661887.)

27932. English Electric Co., Ltd., and Smart, D. L.—Liquid pool cathode-electric discharge devices. 21st October, 1949. (661956.)

28695. British Thomson-Houston Co., Ltd.—Electric hot-plates. 4th November, 1948. (Cognate application 28696. 4th November, 1947.) (661675.)

29476. Metropolitan-Vickers Electrical Co., Ltd.—Amplitude modulated radio transmitters. 12th November, 1948. (661957.)

30313. Lumalampan Aktiebolag, and Kronstrom, N. G. L.—Device for supporting an electric discharge tube within a protective bulb. 22nd November, 1948. (661676.)

32767. Pye, Ltd., and Lax, L.—Apparatus for measuring or using for control purposes, the peak voltage of short duration voltage peaks or pulses. 15th December, 1949. (661890.)

32945. Jack & Heintz Precision Industries, Inc.—High-frequency detector. 23rd May, 1945. (Divided out of 623368.) (661891.)

1949

10. Ekco-Ensign Electric, Ltd., and Stickley, W. A.—Circuit arrangements for electric discharge lamps. 31st December, 1949. (661892.)

1087. Western Electric Co., Inc.—Electrodes for electron-discharge devices. 14th January, 1949. (Cognate application 1088, 17th January, 1948.) (661753.)

2006. Stevens, A. H. (Ranco, Inc.).—Snap-acting electric switching mechanisms and motor control apparatus incorporating such mechanism. 25th January, 1949. (661962.)

2198. Bendix Aviation Corporation.—Anti-hunting circuit for an electrical regulator. 26th January, 1949. (661963.)

2295. British Thomson-Houston Co., Ltd., and Baker, B. S.—Acoustic matching system. 19th January, 1950. (662057.)

2408. Western Electric Co., Inc.—Registration systems employing relays. 28th January, 1949. (661898.)

2420. Switchgear & Equipments, Ltd., and Sharples, F. A.—Contact-retarding mechanism in electric switchgear. 27th January, 1950. (661965.)

3187. Siemens Bros. & Co., Ltd.—Arrangement for illuminating a small object to be viewed. 3rd February, 1950. (661899.)

3746. General Electric Co., Ltd., James, E. G., and Lindell, A. O. E.—Crystal contact devices. 10th February, 1950. (661969.)

4215. Best Products, Ltd., and Best, F. L.—Electric kettles. 2nd May, 1950. (661901.)

4254. Cohen, A. M.—Finger type circuit regulator and contact assembly therefor. 16th February, 1949. (661972.)

4339. Electrolux, Ltd.—Freezing of foodstuffs in refrigerator chambers and the like. 17th February, 1949. (662064.)

5350. Compagnie Industrielle des Telephones.—Devices for waveguides employing ovalized sections. 28th February, 1949. (661905.)

5634. Smith, G. S.—Apparatus for carrying out electrochemical analysis. 1st March, 1949. (661689.)

5876. General Electric Co., Ltd., and Edwards, H. W.—Piezo-electric elements. 1st March, 1950. (661690.)

5973. Consolidated Vultee Aircraft Corporation.—Fluid-pressure operated electric switches. 4th March, 1949. (662067.)

6078. Rover Co., Ltd.—Spot-weld electrodes. 9th February, 1950. (661978.)

6437. Laurence, Scott & Electro-Motors, Ltd., and Wheeler, H. D.—Means for signalling speed changes of a rotary machine and adaptable for governing the speed of such machine. 22nd February, 1950. (661765.)

6683. Electric Resistance Furnace Co., Ltd., and Cook, A. J.—Apparatus for extracting articles from a furnace. 11th March, 1949. (661982.)

6812. Revo Electric Co., Ltd., and Felton, A. E.—Louvre mounting for use in connection with tubular lamp fittings. 13th March, 1950. (662069.)

7333. Westinghouse Electric International Co.—Plural element induction type electrical meters. 17th March, 1949. (661695.)

7375. Ministry of Supply.—Frequency modulation radio altimeters. 17th March, 1950. (661769.)

7479. General Electric Co., Ltd., and Imm, R. C.—Electrical filter circuits. 17th March, 1950. (661773.)

7722. Veritys, Ltd., and Forth, J. W.—Reflectors of suspended electric lamps. 17th March, 1950. (661920.)

8092. Allen, E. H.—Clamps for connecting parts of television aerials. 19th December, 1949. (661777.)

8613. Soc. Industrielle des Procedes Loth.—Power amplifiers comprising electron-discharge tubes. 30th March, 1949. (661782.)

8997. Revo Electric Co., Ltd., and Felton, A. E.—Focusing device for electric lamp fittings. 3rd April, 1950. (661786.)

9876. Kapp, R.—Method of manufacturing pre-formed electrical circuits and circuits produced thereby. 12th April, 1949. (661989.)

9902. Graham & Co., Ltd., A., Vaughan, C. H.—Starting arrangements for electric discharge lamps. 6th April, 1950. (661791.)

10212. Eltron, Inc.—Electric converting apparatus. 14th April, 1949. (662077.)

10358. General Electric Co., Ltd., Forbes, W. A., and Burbidge, T. W.—Automatic telephone systems. 2nd February, 1950. (661991.)

10359. Creed & Co., Ltd.—Teleprinter telegraph systems. 17th April, 1950. (661702.)

10412. General Electric Co., Ltd., Willson, C. R., and Tolchard, E.—Means for joining metals by soldering or brazing. 13th February, 1950. (661932.)

10484. Radio Corporation of America.—Electron-discharge device for generating high-voltages. 20th April, 1949. (662078.)

10764. General Electric Co., Ltd., and Williams, C. E.—Electric circuit arrangements for operating electric discharge lamps. 31st March, 1950. (661705.)

10978. Ekco-Ensign Electric, Ltd., and Stickley, W. A.—Manufacture of ballast transformers for use in the circuits of electric discharge lamps. 24th July, 1950. (661706.)

11464. Standard Telephones & Cables, Ltd.—Combined facsimile transmitting and receiving equipment. 29th April, 1949. (661708.)

11552. National Research Development Corporation.—Thermionic valve amplifying circuits. 17th March, 1950. (661995.)

11753. Walsh, Ltd., E. A. & J. Y.—Electrical resistances. 28th April, 1950. (661996.)

12331. British Thomson-Houston Co., Ltd.—Television cameras. 9th May, 1949. (661797.)

12493. Wabash Corporation.—Silvering incandescent bulbs of the reflecting type. 10th May, 1949. (661799.)

12675. Dernier & Hamlyn, Ltd., and Hamlyn, S. W.—Electric lamp fittings. 3rd April, 1950. (661711.)

12731. Compagnie Générale de Telégraphie sans Fil.—Radio relay stations. 12th May, 1949. (661801.)

12762. Cole, Ltd., E. K., and King, A. E.—Inductance coils with adjustable cores for use in radio receivers and like apparatus. 12th May, 1950. (661802.)

13004. British Thomson-Houston Co., Ltd.—Radial inward flow type turbine or compressor rotors. 16th May, 1949. (662090.)

13576. E.M.G. Handmade Gramophones, Ltd., and Davey, F. G. G.—Electric filter circuits. 30th March, 1950. (661715.)

13966. Pye, Ltd., Cope, J. E., and Theile, R.—Television film scanning apparatus. 16th May, 1950. (661807.)

14047. Soc. Alsacienne de Constructions Mechaniques.—Pulse code signalling systems. 25th May, 1949. (661808.)

14087. Borthayre, J. L. A., and Borthayre, A.—Device for facilitating the connection of radio television or like receiving apparatus to power, aerial, earth and like leads. 26th May, 1949. (661716.)

14091. C.A.V., Ltd.—Thermally-releasable electric switches. 18th May, 1950. (662000.)

14115. P. & B. Engineering Co., Ltd., and Evenden, E. F.—Electric cut-out or protective apparatus. 25th May, 1950. (662001.)

14691. Western Electric Co., Inc.—Amplifiers. 1st June, 1949. (662096.)

15008. Aladdin Industries, Inc.—Magnetic core composition and method for producing the same. 3rd June, 1949. (661721.)

15515. Philips Electrical, Ltd.—Templets for spacing loose objects. 10th June, 1949. (662008.)

16076. British Thomson-Houston Co., Ltd.—Vitreous materials. 16th June, 1949. (662101.)

16140. Swift Levick & Sons, Ltd., Horsburgh, G. D. L., and Tetley, F. W.—Permanent magnets. 15th June, 1950. (661727.)

17226. Radio Corporation of America.—High-frequency dielectric heating method and apparatus for bonding thermoplastic material. 29th June, 1949. (661732.)

17704. Ruston-Bucyrus, Ltd.—Dynamo-electric machine. 5th July, 1949. (661810.)

18495. Westinghouse Electric International Co.—Vapour-electric discharge devices. 13th July, 1949. (662112.)

18913. Mullard Radio Valve Co., Ltd., Birkbeck, G., and Phillips, S. I.—Television receivers. 18th July, 1949. (662114.)

18988. British Thomson-Houston Co., Ltd., and Pollack, A. A.—Commutators for dynamo-electric machines. 22nd June, 1950. (661815.)

19252. General Electric Co., Ltd., Bryden, J. E., Foreman, E. F., and Jarrett, E. E.—Electric coil assemblies. 21st July, 1950. (661817.)

20022. Patra Patent-Administration & Trading Co.—Electric stop-motion for warping-machines. 29th July, 1949. (662117.)

21017. Westinghouse Electric International Co.—High-temperature apparatus such as a steam turbine. 12th August, 1949. (661822.)

23450. Kolb, O. K.—Magnetic sound recording and reproducing apparatus. 10th September, 1949. (662124.)

24158. Westinghouse Electric International Co.—Rotary anode X-ray tubes. 20th September, 1949. (661836.)

25088. Siemens & Halske Akt.-Ges.—Cross bar selector switches for use particularly in telephone installations. 29th September, 1949. (661840.)

25715. Western Electric Co., Inc.—Magnetic recording. 6th October, 1949. (662127.)

27706. Igranic Electric Co., Ltd.—Electric switches. 28th October, 1949. (662036.)

27920. Naamlooze Vennootschap Philips' Gloeilampenfabrieken.—Geiger counters. 1st November, 1949. (662037.)

28653. Lignes Telegraphiques & Telephoniques.—Manufacture of conductors of coaxial pairs. 8th November, 1949. (661846.)

28867. Laine, R.—Electrical resistance units. 10th November, 1949. (662044.)

29074. Hendriks, J., and Ploeg, J. Van Der (trading as Vennootschap Onder Firma O. Keip).—Voltage reducing devices for arc welding systems employing transformers. 14th November, 1949. (661847.)

29260. Delhumeau, R. A.—Screens for absorbing secondary radiation in X-ray apparatus. 15th November, 1949. (662046.)

29304. Erie Resistor Corporation.—Electric circuit assembly and method of making same. 16th November, 1949. (661739.)

30586. Westinghouse Electric International Co.—Carrier-current systems. 29th November, 1949. (661743.)

31675. Standard Telephones & Cables, Ltd., and Childs, P. A.—Method of the securing of electrical connecting tags to an insulating base. 9th December, 1949. (662050.)

31848. British Thomson-Houston Co., Ltd.—Oscillating fans. 12th December, 1949. (661747.)

32245. Triggs, W. W. (Edison, Inc., T. A.).—Electric safety lamp. 15th December, 1949. (661748.)

33120. Edison Swan Electric Co., Ltd.—Thermionic valves. 28th December, 1949. (661750.)

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

CONTRACTS OPEN

Where "Contracts Open" are advertised in our "Official Notices" section, the date of the issue is given in parentheses.

Australia. — SYDNEY. — 8th November. County Council. Three 13,500 kVA 3-phase transformers. (C.R.E. (I.B.) 72592/51. Ten/3077.)*

Belfast.—7th December. City Electricity Department. L.p. piping installation at Victoria power station. (See this issue.)

Bournemouth.—6th November. Corporation. Supply of 150 street lighting columns. (See this issue.)

Ceylon.—Government. Construction of stage 2A of the hydro-electric scheme at Watawala. Date for application extended to 21st November. (See this issue.)

Derby.—6th November. Corporation. Street lighting installation, Queensway. (See this issue.)

Exeter. — 29th October. City Council. Switchgear for Pynes Waterworks. (See 12th October issue.)

Lutterworth.—24th October. R.D.C. Electrical installation work in 40 new houses. Tender forms from surveyor, Council Offices

New Windsor.—17th November. Town Council. Electric lamps, fittings and cable for the year ending 31st December, 1952. Forms of tender from borough engineer, the Kipling Memorial Building, Alma Road.

Nigeria.—LAGOS.—30th October. Electricity Corporation of Nigeria. Supply of 670 electric cookers, 1,000 electric kettles, 180 electric water heaters, 23 ceiling fans, 1,150 table and bracket fans, 120 refrigerators and 550 30 A cooker control units. (C.R.E. (I.B.) 72592/51. Ten/3078.)*

Salford.—30th November. City Street Lighting Department. One motor tower wagon. (See this issue.)

Wiltshire.—21st November. County Council. Electrical installation in new primary school, Lyneham. (See this issue.)

ORDERS PLACED

Liverpool.—Passenger Transport Committee. Accepted. Re-wiring part of the Dingle tram and bus depot (£565).—H. C. Woolliscroft & Co.

Lowestoft.—Corporation Housing Committee. Electrical installations in 46 houses on the Whitton estate (£1,092).—Eastern Electricity Board.

*Specifications may be inspected at the Commercial Relations and Exports Department, Board of Trade, Thames House North, Millbank, S.W.1 (Victoria 9040).

CONTRACTS IN PROSPECT

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Aberystwyth.—Dwellings (90), Penybont estate; borough surveyor.

Alnwick (Northumberland). — Houses (200), Shilbottle, for R.D.C.; Reavell and Cahill, Lloyds Bank Chambers.

Alsager.—Houses (70), Close Lane, for U.D.C.; H. Lees Bros., The Crescent, Hockley, Birmingham.

Birkenhead.—School, Northwood Road and Bramwell Avenue; borough engineer.

Birmingham.—Maternity and child welfare centre, Ridgacre Road, Quinton; J. F. Gregg, town clerk, Council House.

Bristol.—School, Hartcliffe estate; city architect, Eagle House, Colston Avenue 1.

Bury.—Pathology laboratory at General Hospital (£55,800), for Regional Hospital Board; T. Duffy, architect to the Board, Sunlight House, Quay Street, Manchester, 3.

Carlisle.—Additions to Harraby Infants' School (£12,000); R. C. Williamson, Ltd., builders, Rowlands Gill, Co. Durham.

Cheltenham. — Factory, Swindon Lane; Davis, Wynn & Andrews, Ltd., Wellington Road. First section of North Gloucestershire Technical College (£73,219); A. C. Billings & Son, builders, Winchcombe Street, Cheltenham.

Chester.—Houses (106), Blacon; Thomas Warrington & Sons, Ltd., builders, Park Drive, Hoole.

Dartford.—Dwellings (80), Temple Hill Neighbourhood Unit (£91,450); Hawker-Smith, Ltd., builders, Rochester Way, Bexley.

Deal.—Houses (100), North Deal area; J. L. Sharratt, borough surveyor, Municipal Offices, Nevile House, Queen Street.

Dover.—Factory, Beaconsfield Road and Granville Street; London Fancy Box Co., Ltd., Bridge Street.

Eastbourne.—Works, Brampton Road Trading Estate; William Harden, Ltd., 38, Grove Road.

Edmonton.—Houses (54) and nine aged persons' dwellings, Flamstead End site; housing architect.

Enfield.—Houses (60), Bullsmoor Lane, for U.D.C.; Townsend & Collins, Ltd., builders, 2, Brick Lane.

Glasgow.—Tenement houses, shops etc. (2,100) at Garthamloch for Glasgow Corporation; city architect, City Chambers.

Hemel Hempstead.—Factory for Rotax, Ltd., manufacturing electrical engineers; Clifford Tee & Gale, architects, Moorgate, London, E.C.2.

Higham Ferrers (Northants).—Houses (38), George Street; Robert Marriott, Ltd., Rushden, Northants.

Inverness.—Warehouse and office block for G. A. Spears, Ltd., London (£20,000); A. D. Mackillop, Inverness.

Leeds.—Houses for T.C. Swinnow and Moorside estates (210); Spooners (Hull), Ltd., Glebe Road, Stonelerry. Flats (28) and houses (8), Swinnow estate; R. M. Thompson, Ltd., 29, Lady Lane, Leeds.

Liverpool.—Physiotherapy department at Walton Hospital; Ormrod & Banister, architects, 49, Rodney Street.

London.—CAMBERWELL.—Dwellings at Hanover Park and Raul Road (24) and Naylor Road (16); borough engineer, Peckham Road, S.E.5.

HOXTON.—Block of shops and flats; W. Phillips & Son, 39, Hall Place, W.2.

LEWISHAM.—Development of estate at Heathfield House, Elliot Place, for 154 dwellings, etc.; borough architect, Canadian Avenue, Catford, S.E.6.

Out-patients' department at Lewisham Hospital (£184,000); South East Metropolitan Regional Hospital Board.

SHOREDITCH.—90 flats, New North Road, for B.C.; Walter Lawrence & Son, Ltd., builders, 31, Sun Street, E.C.2.

Macclesfield.—New factory at Hurdsfield for John Morris (Fire Snow), Ltd., Stockport; R. A. Riseley, architect, Macclesfield.

Manchester.—Cream canning works at Silver Street for Unicream, Ltd., Broughton Lane, Salford (£25,000); L. D. Clegg Morgan & Co., architects, Queen Street, Oldham.

Matlock.—Bus station, Bakewell Road, for U.D.C.; M. Chamberlain, surveyor, Town Hall.

Merton and Morden.—Flats (54), Grand Drive, S.W.20; H. May, clerk to U.D.C., Morden Hall, S.W.19.

Middlesbrough.—New college at Longlands (£125,000); P. R. Middleton, education architect.

Factory addition on East Middlesbrough trading estate for J. Wilson & Son, Ltd.; North-Eastern Trading Estates, Ltd., Low Fell, Gateshead.

Offices for Tees Towing Co. and factory in Suffield Street for Greco Brothers; Kitching & Co., architects, 21, Albert Road.

Newcastle-on-Tyne.—College of technology (£708,000); city architect, 18, Cloth Market.

Conversion of "Eskbank" into old people's home; city architect, 18 Cloth Market.

Newcastle-under-Lyme.—Dwellings at Windermere Road for Corporation; J. Jones, Ltd., Liverpool Road (88 houses and 6 maisonnettes); G. A. Poole, Longton Road, Trentham (95 houses and 4 maisonnettes); and R. Nabney, Shelton New Road (14 houses and 8 maisonnettes).

Northampton.—Houses (44), Sunnyside; T. Wilson & Son, Ltd., 67, Sheep Street.

Nottingham.—Proposed new concert hall; Cecil Howitt & Partners, architects, St. Andrew's House.

Penrith.—Houses (28), Holmeriggs Avenue for U.D.C.; J. Laing & Sons, builders, Dalston Road, Carlisle.

Portsmouth.—Flats (54), Grosvenor Street; city architect.

Out-patients' department at St. James' Hospital; Roy Corke, Ltd., builders, Rugby Road.

Rhondda.—Dwellings (130), Maerdy site (£199,000), for U.D.C.; D. J. Rees, builder, Tram Road, Pontypridd.

Richmond (Yorks).—Infants' welfare centre and health office (£13,650); borough surveyor, Town Hall.

Scunthorpe.—Secondary modern school; county architect, Lindsey C.C., Lincoln.

Seaham Harbour (Co. Durham).—Houses (40); surveyor, U.D.C. Offices.

Sedgley.—Factory, Hermit Street; Builders' Accessories (Dudley), Ltd., Wolverhampton Road East, Sedgley.

Sheffield.—Stage 2 of Herries Road omnibus depot; W. G. Robson, Ltd., Bamforth Street.

Somerset.—Schools at Portishead (£174,720) and Writhlington (£148,020); county architect, County Offices, Taunton.

Stalybridge.—Additions to works for the Bridge Colour Co., Ltd., Worthington Street; Dew & Partners, architects, Market Place, Hyde.

Stoke-on-Trent.—Bus depot for Potteries Motor Traction Co., Ltd.; Ball & Robinson, Ltd., builders, Trent Bridge Works.

Sunderland.—Further additions to Fulwell fire station for T.C. (£10,000); borough architect, Grange House, Stockton Road.

Primary and infants' schools at Hylton Red House estate; borough architect.

Swindon.—Abattoir for Ministry of Food; Staverton Builders, Ltd., Staverton Bridge Mills, Totnes.

Todmorden. — Single-storey extension to library; borough surveyor.

Tynemouth.—Old people's homes, Marden (£27,610); J. H. Rogers, builder, Regent Terrace, North Shields.

West Bromwich.—Factory and offices, Birmingham Road; British Typewriters, Ltd., Queen Street.

Whickham (Co. Durham).—Houses (54) for U.D.C.; G. S. W. Urban Development Co., Ltd., builders, The Side, Newcastle-on-Tyne.

Radio Servicing Certificate

THE results of the Radio Servicing Certificate Examination have been announced by the Radio Trades Examination Board and the City and Guilds of London Institute. Altogether 290 candidates appeared for the examination in May this year and 117 satisfied the examiners in both the written and practical tests; 46 passed the written examination but were referred in the practical test and 19 completed the examination, having been referred in the practical test in the May, 1950, examination.